AN OUNCE OF PREVENTION: THE EFFECTS OF CRITICAL THINKING DISPOSITION AND MESSAGE FRAMES ON BEHAVIORAL INTENT FOR LOW-INVOLVEMENT RISKS

BY

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For Jim, Jimmy, Annie and my Mom.

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As global trade increases so does the potential for increased establishment of invasive species. This low-involvement risk is one example of an issue that can be addressed and, if appropriate behavioral action is taken, prevented. Low-involvement risks are risks that do not generate much attention because they are futuristic in nature. Additionally, individuals frequently do not relate their singular actions as being germane to the overall issue.

Communicators are frequently required to develop strategies to address low-involvement risks. This study sought to explore whether critical thinking disposition, when coupled with various message frames, resulted in different levels of behavioral intent. The results indicated that respondents with high critical thinking dispositions who received a message focusing on the benefits of performing a preventive behavior formed a stronger level of behavioral intent than respondents with low critical thinking dispositions received a message focusing on the costs of not performing the preventive behavior.

TABLE OF CONTENTS

ACKNOWLEDGMENTS iii

ABSTRACT..... iv

CHAPTERS

1 INTRODUCTION

Introduction to the Study 1
Risk Assessment 4
Need for Cognition 5
Risk Communication 7
Attitudes 9
Purpose and Objectives of the Study 10
Relevance of the Study 12
Organization..... 12

2 LITERATURE REVIEW

Overview..... 14
Risk Perception 14
  Evaluation of Risk..... 14
  Attitudes Toward Risk 16
  Risk Communications..... 18
Critical Thinking Disposition and Receptivity to Risk Information..... 21
  Analycity Risk Application..... 25
  Self-Confidence Risk Application 26
  Inquisitiveness Risk Application 26
  Maturity Risk Application 27
  Open-Mindedness Risk Application 27
  Systemacity Risk Application..... 28
  Truth-Seeking Risk Application 28
Moving from Affect to Action 30

3 METHODOLOGY

Overview..... 39
Hypotheses..... 41

Subjects 41
Research Design 42
Instrumentation 44
    Florida Critical Thinking Disposition Scale 44
    Theory of Planned Behavior Model 45
Independent Variables 49
    Message Treatment 49
    Florida Critical Thinking Disposition Scale 49
Dependent and Moderating Variables 50
    Summated Indices 50
    Belief-based Measures 50
    Direct Measures 51
    Behavioral Intention as a Dependent Variable 51
Procedures 54
Data Analysis 56

4 RESULTS

Descriptive Data 57
Manipulation Checks 58
    Message Version 59
    Florida Critical Thinking Disposition Scale 60
Theory of Planned Behavior Constructs 66
Hypotheses Tests 70
Post Hoc Analysis 80

5 DISCUSSION

Overview 84
Key Findings and Implications of the Study 84
Limitations 87
Conclusions and Directions for Future Research 88
Recommendations 90

APPENDICES

Appendix A 92
Appendix B 96
Appendix C 115

REFERENCES 121

BIOGRAPHIC SKETCH 130

CHAPTER 1
INTRODUCTION

Introduction to the Study

Gains in science and technology have increased our ability to conduct business on a global level. Within this context, desirable opportunities abound along with some undesirable consequences. One of these undesirable consequences is the increased speed and higher rate at which we spread non-indigenous species that can become invasive species. Invasive species, such as water hyacinths, have been shown to impact our ability to conduct business and enjoy recreational activities in the natural environment (Simberolff, Schmitz & Brown, 1997). Once established, invasive species become a long-term problem and may have reciprocal effects. As one species is driven out, other species that relied upon it for food or cover may disappear from the ecosystem as well (Schmitz, Simberloff, Hofstetter, & Sutton, 1997).

Invasive species have become established as a result of both intentional (meleleuca in the Everglades) and unintentional introductions (zebra mussel in the Great Lakes, and cheatgrass in California) (Simberolff et al., 1997). Invasive species are both an environmental and economic threat in that they not only promote undesirable homogeneity and lack of biodiversity for native wildlife and vegetation, they are also costly to control or eradicate via chemical, biological, mechanical and ecological control methods (Vitousek, 1986; Schwartz, & Randall, 1995).

While negative environmental impacts are usually thought of in terms of industrial development, natural or "green pollution" can be equally destructive. Invasive species are a good example of green pollution. The impact of invasive species on the agricultural industry alone exceeds billions of dollars each year (Pinmentel et al., 1989). For example, most weeds are accidentally introduced with crop seeds and from imported plant materials (Pimentel et al., 2000). Additionally, non-indigenous birds and animals cost over $1 billion a year in crop damages (Pimentel et al., 2001). Furthermore, microbes and other parasites cost approximately $3 billion a year in livestock losses in the U.S. (Drummond et al., 1981). As global trade practices increase, a risk exists that the potential losses from invasive species to agriculture and natural resources will also increase.

Slovic (1987) states, "Whereas technologically sophisticated analysts employ risk assessment to evaluate hazards, the majority of citizens rely on intuitive risk judgments, typically called 'risk perceptions'" (p. 280). While it may be assumed that some environmental risks can be considered high-level and require immediate attention, such as an impending storm, there also exist other risks, including those posed by invasive species, which may be considered low-involvement (futuristic and preventable) in their scope.

Additionally, it can be difficult to assess response to environmental risks. Many issues fall under environmental risks such as recycling, vehicle mileage, and clean water. Perception of environmental risks are frequently synthesized together to form a macrocategory in which almost every action one takes has an effect upon some aspect of the environment (Ungar, 1994). How one perceives and subsequently responds to a specific environmental risk is, in part, due to one's overall perception of this macrocategory.

Specific environmental risks are frequently perceived as not having imminent consequences to one's health or safety, and are consequently set aside in favor of more pressing issues. The factors that influence how one evaluates environmental risks can vary depending on how motivated one is in a given situation (Hungerford & Volk, 1990). Realistically though, these low-involvement risks (futuristic and preventable) have the potential to gain momentum or immediacy and turn into an imminent risk that demands our immediate attention, such as the use of DDT in areas of New York in the late 1960s (Loftis, 1997). This issue was the impetus for the formation of the Environmental Defense Fund (EDF) and its subsequent court victory to halt the use of DDT. These events created momentum for the environmental movement. In 1970, the first Earth Day was held and the Environmental Protection Agency was formed to consolidate a variety of federal monitoring, standard setting and enforcement agencies (Christian Science Monitor, 1995). These groups and events served to legitimize individuals' concerns about the risks associated with man's use and misuse of natural resources and the resulting impact upon the environment.

Lazo, Kinnell, and Fisher (2000) found that lay people perceive environmental risks to be significant yet manageable. The same study found that experts are more accepting of environmental risks, but they do not find them to be more manageable. The differing views between environmental experts and lay people are based on whether the event can be controlled or not. On this level, experts feel that environmental risks are less controllable than lay persons believe them to be.

Risk Assessment

Professionals evaluate risk in terms of probability X consequences (Kemp, 1993). However for lay people, risk perception is rooted deeply in the subjective decision making context (Cole & Withey, 1981). Sandman (1987) argues that individuals tend to dichotomize risk: risks are perceived to be either very scary and imminent or distant and ignored.

It can be assumed that low-involvement risks, such as invasive species, fall into the latter category. Low-involvement risks can be thought of as risks that are not imminent and where people may perceive their involvement as contributing very little to the overall situation. Consequences from this type of risk are accumulative and require repeated actions over a period of time or lack of intervention over time (Simberloff, Schmitz & Brown, 1997). Information about this type of risk tends to be the product of scientists reaching a new level of understanding about an existing topic or new methods of gaining base-line data.

Health issues, such as the linkage between diet and heart disease and environmental issues, such as consumer driven deforestation, are other examples of this type of low-involvement risk. There may be an understood societal agreement about the risk, and one's beliefs about the risk may reflect this societal norm. However, the perceived level of control may be the most determining factor. The fact that one continues to contribute to the risk may be qualified by the belief that the actions of only one person could not possibly contribute significantly to the overall problem (Hines, Hungerford, & Tomera, 1986). Communication strategies employed to address these issues have met with varying levels of success.

The key to effective risk communications is to get the message recipient engaged in the evaluative and decision-making process (Smith & Petty, 1996). Herein lies the conundrum. In terms of low-involvement risk, does one become engaged in the evaluation and decision-making process because one is predisposed to do so, or does the information about the long-term risk jumpstart the process?

Need for Cognition

Trumbo (1999) states that in order to develop a risk judgment, individuals will use systematic processing, heuristic processing, or a combination of both processes. Systematic processing occurs through careful analysis and comparison. Those adopting this process are cognitively engaged and perform their own evaluation of a situation. Heuristic processing is more of a "go with the flow" type of approach. Those adopting this process may rely on expert opinion or social norms.

Issues that are perceived to be low-involvement in terms of risk may result in people readily agreeing with others' opinions and, until proven otherwise, trusting that the decisions reached via the evaluative process of others is accurate and sufficient. The systematic process is driven by individuals' needs to adopt attitudes that reflect the facts (Eagley & Chaiken, 1993).

Research has shown that individuals with a high need for cognition (NC) may process information to a significant extent regardless of whether the information is framed positively (potential gain of engaging in the desired behavior) or negatively (potential cost of not engaging in the desired behavior) (Smith & Petty, 1996). High NC individuals are influenced less by the message frame than low NC individuals because they are already highly engaged in the process. Alternatively, low NC individuals tend to be more responsive, or cognitively involved with negatively framed information.

Tversky and Kahneman (1974) indicate that any cognitively formed decision must be compatible to the existing web of beliefs one has already developed. Cognitively involved message recipients engage in the evaluation and decision-making process. This process is necessary to change (or develop) attitudes that lead to the intent to change behavior (Ajzen & Fishbien, 1977).

Each day we make many large and small decisions in a "systematic, consistent and organized fashion" (Baumeister, 1991, p. 54). These decisions require evaluative processing. Using schema, a process people use to encode information, ideas are interpreted (Fiske, 1991). Schemas affect how quickly one pays attention to information as well as help to guide memory. Existing information stored in one's memory can influence decisions, but many decisions are made instantaneously as the information is received (Bassili, 1989). Schemas affect the amount of attention paid to information, how the information is linked to previous memory, and the level of judgment applied at the time of receiving the information. Ideas themselves can influence how and to what extent people think about information. Facione (1990) describes this information processing as a combination of critical thinking cognitive skills (inherent and learned) and the disposition to use these skills.

Critical thinking skills (CT) outline the mechanical mental steps one undertakes in the cognitive process. In1990, Facione published a Critical Thinking Delphi report that investigated critical thinking dispositions and critical thinking skills. These dispositions, or "habits of mind," propel one to be engaged in critical judgments (Facione, 1990).

While much research has focused on the role of critical thinking in the educational arena, research efforts have also focused on the role of dispositions in one's personal and professional life beyond the time that the individual is engaged in a formal instructional setting. There has been additional debate on the linkage between subject specificity and CT disposition (Ennis, 1989; McPeck 1990; & Ennis, 1990). While there is a relationship between the topic and the level of evaluation about the topic, research has documented that critical thinkers are purposive and understand the issues (Paul & Elder, 2001). Paul (2001) remarks that one cannot learn specific content if one has not figured out which questions to ask and how to solve problems. If one is disposed to use critical thinking skills, one can make sense of what is known and what is not known, and arrive at some determination about the risk based upon the information available.

Risk Communication

Risk communicators not only are concerned with how people evaluate risk, but whether they even evaluate the risk based upon the information contained in the message. Low-involvement risks often represent risks that can be prevented if addressed. Several organizations, such as the Nature Conservancy, the Department of Environmental Protection, and the Department of the Interior, are attempting to educate target audiences about one such preventable risk, the invasive species issue. The goal of communicating about this type of risk is to prompt the message recipient into engaging in a new behavior or to cease a potentially harmful behavior (Ajzen, 2001).

One of the difficulties involved in creating a sense of salience about a potential risk is that it usually takes non-indigenous species a substantial period of time to become established. On the plus side, this extended time frame should provide enough time to prevent and/or reverse potential damage. On the minus side, this extended time frame may undercut the potential severity of the situation because it is so gradual. Thus, different perspectives may result in different decisions even though the same information is used as the evaluative tool. These messages, if even decoded, are often examined in the context of existing beliefs, perception of their ability to control the situation and what peers are doing about the situation (Rogers, 1995).

Often times, evaluation of information presented about a risk may require a two-stage process. First, the source must be evaluated and then the issue can be evaluated. For example, Siegrest and Cvetkovich (2000) report that social trust is an important dimension in forming an attitude. Social trust, or source credibility, is the likelihood that the issuing organization is trustworthy. This projection by the person receiving the message can add or detract from the persuasiveness of messages (Heath, Seshadri, and Lee, 1998). Once source credibility is established or discounted, the content can be evaluated.

Research focusing on message frames has been shown to be pertinent to the risk assessment issue. Message frames may be designed to heighten sensitivity to a risk in order to prompt a change in attitudes (Sjoberg, 2000). Based on prospect theory, people evaluate information about risk in terms of potential gains or potential losses (Kahneman & Tversky, 1979; Smith & Petty, 1996; Davis, 1995). Messages highlighting potential gains, or benefits, of engaging in a desired manner focus on positive outcomes. Alternatively, messages highlighting potential losses, or costs, of not engaging in a desired manner focus on the negative outcomes.

Attitudes

Human behavior is not a neatly arranged and logical package of interaction. One's life experience, education, and social groups, etc., contribute to the formation of attitudes. People interpret information differently and form attitudes toward certain behaviors based on this interpretation (Johnson, 1993). These attitudes are comprised of personal beliefs and shared beliefs. Because humans do not share a common sequence of experiences, these beliefs may differ (Trumbo, 1999).

Relevant studies have shown that ". . . subjects rely upon individual heuristics when evaluating potential risk, and that these heurisitics tend to systematically bias perceptions of risk" (Cole & Withey, 1981, p. 145). Other research has stated that people respond to the hazards they perceive (Slovic, Fischoff, & Lichtenstein, 1980).

Based upon the Theory of Planned Behavior, underlying beliefs about behavior toward the attitude object, societal norms and control, alone and in their aggregate, help one to form attitudes toward a behavior (Ajzen, 1971). Theoretically, the more favorable the attitude is toward the behavior, the stronger is the intent to perform the behavior. In terms of the invasive species risk, beliefs about potential outcomes or about realistic levels of control over the issue, when combined with unperceived peer pressure, may result in weakly held attitudes and subsequent action. Thus, the invasive species issue may not generate strongly held attitudes and the subsequent intention to behave in a certain manner may not reach fruition.

Purpose and Objectives of the Study

While some invasive species introductions have been intentional (fish released to improve a recreational value of an area) or accidental (birds released as a result of Hurricane Andrew), most introductions are a result of repeated smaller introductions by humans (landscaping with non-native plants and the release of exotic pets) (McCann, Arkin, & Williams, 1996).

However, research suggests that while information alone is sufficient to raise awareness, it is not necessarily enough to cause individuals to perceive a risk as equally important to them. According to Heath, Liao, and Douglas (1995) ". . . scholars have recognized the importance of receiver-centered, cognitively oriented explanations of how and why people seek and use information" (p. 90). Indeed, the relevant literature has consistently shown that simple exposure to information, such as that which can be achieved through mass media, will not necessarily influence knowledge, attitudes or behavior (Rogers, 1995). Risk communication can even create a distorted view of the risk for some individuals which "creates inequalities and unfairness in the decision making process" (Kemp, 1993, p.115). This is a problem for organizational risk communicators, such as those in agricultural communications, many of whom disseminate information both to inform the public about the serious nature of a specific risk, as well as provide instructions as to how to combat it. It is therefore important to understand how and why individuals differ in their evaluations and sensitivity to risk information, so as to be able to better target information messages designed to achieve actionable outcomes.

The ability to predict how the public's attitudes are influenced by their disposition to think critically about a long-term risk could make it easier, and more cost effective, for risk communicators to develop information that will help stimulate cognitive dispositions toward evaluating risk and reaching a judgment that results in the desired behavior.

The purpose of this study is to therefore examine the relationship of critical thinking disposition and message frames (benefit or risk) on the attitude-intent-behavior relationship as modeled in the TOPB framework (Ajzen, 1991) specifically focusing on low-involvement risks associated with the invasive species issue. This study will use lovebugs as the invasive species of interest. This insect is a non-indigenous species found along Florida's highways during the months of May and September which collide with automobiles leaving remains on the windshields, hoods and grilles. This study will therefore attempt to answer the following questions:

1. to what extent is critical thinking disposition a factor in influencing intent to engage in a specific action designed to mitigate or reduce a low-involvement environmental risk.

2. how do critical thinking dispositions influence processing of risk/benefit messages designed to address low-involvement risks and consequently form attitudes and intent toward a desired behavior;

3. which combination of factors best predict one's attitude and intent to perform the desired behavior toward a low-involvement environmental risk, mitigation of which requires taking a specific violitional action.

Relevance of the Study

Left unchecked in today's global economic and environmental culture, the invasive species issue is set to engage at warp speed. While the invasive species issue is only one of many such environmental risk issues that deserve our attention, it may potentially be the most important and, if left unaddressed, irreversible environmental issue that confronts us today (Simberloff et al., 1997). The potential consequences of ignoring this low-involvement risk issue may be of immense economic importance to the future of agricultural and natural resource industries.

Knowledge about the potential cognitive predisposition of those receiving information about this risk could be crucial in developing effective messages. Knowing that behavior is based on intent to behave and that intention is based upon one's attitudes, subjective norm and perceived level of control can aid the communicator in developing an intervention that addresses these domains (Ajzen, 1991).

Understanding how one's predisposition to think critically in terms of accepting and evaluating messages about long-term risk can aid communicators in developing information that targets specific critical thinking predispositions. This information has practical applications as well as the potential to contribute to the existing body of knowledge of risk perception and evaluation.

Organization

The introductory chapter developed the problem to be investigated, the theoretical constructs to be used in investigating the problem and the purpose and objectives of this study. The second chapter of this dissertation will examine the literature in the fields under study. This includes literature on risk perception, critical thinking disposition, message effectiveness, and the application of the Theory of Planned Behavior. Chapter 3 provides a comprehensive overview of the methodology used in the proposed study, including hypotheses and the independent and dependent variables, pre-testing of message content, reliability of scales, description and identification of the participants, procedure, and the statistical analyses utilized. Chapter 4 reports the results of the data analyses conducted to test the hypotheses and the post hoc analyses. Chapter 5 includes the limitations, discussion, and conclusion section of the dissertation.

CHAPTER 2
REVIEW OF RELEVANT LITERATURE

Overview

The literature review focuses on three research paradigms. These include risk perception frameworks, which deal with how risk is perceived including message frames; critical thinking disposition, which deals with the predisposition of an individual to consider and evaluate new information toward an attitude object; and the Theory of Planned Behavior, which deals with modal accessible beliefs, or the most commonly held beliefs, toward a desired behavior and consequently the intention to adopt, or not, the desired behavior associated.

Risk Perception

Evaluation of Risk

For the purposes of this study, the invasive species issue was considered to be an example of a low-involvement risk, a risk that does not require immediate attention because the repercussions are not imminent and severe. The invasive species issue is affected by numerous individual actions repeated over time. The probability that a non-native species will become established and invasive is determined by the appropriate environmental conditions being present along with the human intervention. While many people understand the definition and premise of invasive species, the issue itself remains very low-level except in areas where there have been extensive invasions such as in the Great Lake states where the zebra mussel is solidly established (Connaughton, 1999).

How exactly do we determine if an issue or a situation presents a potential risk? Historically, “Risk perception methods were developed to improve our understanding of public concerns about risky technologies, products and activities. They are multi-dimensional and frequently messy because that is the way human cognition and judgment operate in the real world” (Gregory, 1991, p. 8). Some information is developed through first-hand experience or through conversations with others who serve as a credible source. A third avenue is through the mass media. Lacking a representative symbol for environmental problems and issues keeps the media at bay and thus the public from becoming involved in policy making as it relates to these issues (Wilkins & Patterson, 1991). Stories highlighting risks are the very essence of successful media because they focus on the problem. However, this form of communication can leave the public with little sense of efficacy in relation to the problem.

The evaluation, or risk judgment, results in risk perception (Trumbo, 1999). The study of risk perception has primarily focused on technical risk (Fischoff, Slovic, & Lichtenstein, 1981; Sjoberg, 2000). Frequently, risks are categorized as low-level risks by experts, such as nuclear power, but due to the lack of understanding by the general public, they are perceived as high level, or potentially imminent, risks. Some risks come with built-in symbols such as visions of an area ravaged by a tornado. However, “Such symbols are not readily available for many ecological problems” (Wilkins & Patterson, 1991, p. 176). Stories highlighting risk and controversy are the essence of successful media because they focus on problems. This form of communication can leave the public with little sense of efficacy in relation to the problem (Fico & Soffin, 1994).

Lay people tend to use a subjective approach versus the objective approach employed by risk assessment professionals. Krimsky and Plough (1988) discuss the fact that there are two competing models of risk assessment: one technical for experts and one cultural for the lay public. Some risks have "signal value" because they serve as societal precursors to future similar events (Kemp, 1993). Events such as the Three Mile Island accident served as the signal value function to enhance the public's perception of, and sensitivity to, the risk of nuclear power, thus helping to portray the risk, in many people's minds, as being frightening. The resulting attitude toward nuclear power was one of dislike and disfavor.

Attitudes Toward Risk

When one lacks personal knowledge of a risk, studies have shown that the public relies on social trust, the attitude the person holds toward the organization, or "expert," issuing the information. Frequently, social trust substitutes for personal knowledge (Siegrest & Cvetkovich, 2000, p. 717). Conflicts arise when competing sets of information are generated concerning an issue (Earle & Cvetkovich, 1995). Research has shown that the level of social trust depends on the issuing agent. Trust in an industry was increased by perceptions of concern and care while trust in government was increased by perceptions of commitment to results (Peters, Covello, & McCallum, 1997).

Trumbo (1999) states that this reliance on social trust, or expert opinion, is utilized when individuals use "simple decision rules" to help them arrive at a judgment about the validity of a message and is an example of heuristic processing (p. 392). When engaged in heuristic processing, there is a tendency on the part of the message recipient to agree with the overriding social consensus. This approach requires less effort on the part of the individual than the systemic processing approach. The systemic processing approach is a method of careful evaluation that involves comparison and contrast of information available about the risk. The systemic method is characterized by a greater desire to know, or reach a truth, on the part of the individual.

In order to process information about risks, certain pragmatic conditions must be present before the process can be employed (Crunkilton, 1996). The first condition is that a situation, problem or process must be available in order to be thought about. The second condition involves having something to think with such as background, knowledge and information resources. The third condition requires structures with which to guide the process. These can be obtained through previous life experiences or through interpersonal channels. The final condition is the need for a reason to think critically (Crunkilton, 1996). This condition can be satisfied based upon the salience of the issue.

In terms of the invasive species issue, it can be assumed that with respect to risk perceptions, the first condition can be met by becoming aware of a specific risk. The second condition can be met by pairing the new information with previous first-hand experience or secondary information sources. There are environmental issues such as recycling and deforestation in the rain forests that are familiar to individuals based upon personal experience and media exposure. This level of familiarity allows one to pair the new information about an issue with existing information. The third condition can also be met through utilizing previous experiences as a road map of how to evaluate the situation (or not). The final condition for the need to think critically may be met by the person's attitude toward how immediate the risk is, how potentially harmful it is and how likely it is that the person assessing the situation might be affected by the risk.

Risk Communications

The type of risk information that individuals pay attention to and use as a basis of evaluation varies from person to person and how this information is assessed and used is not necessarily rational (Petty, 1999). Research has demonstrated that an individual's risk perception can be affected by how a problem is presented (Johnson, 1993). In terms of environmental issues, messages can be framed as positive (gains) or negative (losses) and they can be presented as short or long-term (Davis, 1995). Negatively framed messages focusing on losses have been found to be more persuasive because they are perceived by individuals as being more salient (Fagley & Miller, 1990). Smith and Petty (1996) found that the negatively framed messages may result in more attention being paid to an issue because an individual may have anticipated the issue being presented in a positive frame.

Typically, risk communications research has demonstrated that the most desirable format for presenting risk information is to compare the same risk at two different times (Slovic, Kraus, & Covello, 1990). If the goal is to prevent a risk, or minimize a risk, the information would be presented as the current status versus a future status. The information could be presented as a cost (or the price of not doing anything) or benefit (the advantage of implementing a specified set of actions). In terms of the invasive species issue, information could be presented as the current status versus the future status of no intervention that highlights the potential negative changes to the environment.

Prospect theory (Kahneman & Tversky, 1979) states that "people evaluate information regarding uncertain (risky) alternatives in terms of either potential gains (positive framing) or potential losses (negative framing) and that preferences can be altered by changing the way information is presented" (p. 257). Williams and Olaniran (1998) suggest that risk information be presented on a comparison basis. Unfamiliar risk that is presented in an analogical fashion which ties the unfamiliar subject to a familiar event can alleviate levels of uneasiness about the event and educate respondents. This setting can supersede the need for social trust as the event is moved back into the arena of personal knowledge.

Typically, humans employ the optimistic basis (OB) framework when assessing risk (Joffe, 1999). The optimistic bias framework provides a reason for the risk assessor to respond in a self-protective manner when determining the level of risk. "A fundamental determinant of OB is the perception that becoming affected by the risk is preventable by individual action" (Joffe, 1999, p. 58).

While there is much research on how people perceive and respond to risk, there is less research on why some people choose to evaluate and act upon a risk. Grunig's (1983) situational theory suggests an explanation as to how people approach risk issues. *Evaluation of a situation* includes problem recognition, constraint recognition, and level of cognitive involvement that then determines if a person engages in active communication behavior or passive communication behavior. *Problem recognition* is comprised of determining whether one's own actions, or the actions of others will result in negative outcomes. *Constraint recognition* is based on the perception as to whether the individual has any control over these actions. The *level of cognitive involvement* is the degree to which the individual feels a connection to the situation. *Active communication behavior* occurs when the individual becomes information seeking and is willing to expend sufficient effort to obtain information on the topic. *Passive communication behavior* results in information processing and determines the individual's willingness to pay attention to a message in its entirety.

Research has shown that people tend to overestimate dramatic and sensational events and underestimate risks associated with everyday events (Fischoff, 1985). Such misjudgments may be influenced by the memorableness of events. Intense evaluation of a risk by an individual can result in dread and can be a central factor in risk perceptions. According to Cole and Withey (1981), there is no centrally established level of acceptable social risk. In other words, each person evaluates and determines their own threshold of acceptable risk.

Some individuals may be risk averse, thereby choosing to ignore any information associated with a risk (Weidermann, 1993). Ultimately though, knowledge is meaningful information (Johnson, 1993). All information requires interpretation to provide meaning. However, this may be more true for some individuals than.

To gain meaningful knowledge, an individual must be cognitively involved. Ennis (1989) proposes that these cognitive processes and behaviors represent critical thinking through "reasonable reflective thinking focused on deciding what to believe or do" (p. 4). Research has shown that it is possible for some people to be disposed to the type of mental analysis that involves critical thinking. Paul (1990) provides the explanation that one cannot learn specific content if one has not figured out how to answer questions and problems - a component of thinking critically. In terms of the invasive species issue, one might not perceive that invasive species is a serious risk if one cannot figure out how and why it is a problem and what can be done to prevent the problem.

Critical Thinking Disposition and Receptivity to Risk Information

Critical thinking has been a topic of exploration and clarification for the past twenty-five years. In 1985, Robert Ennis stated that, "I believe critical thinking to be reasonable reflective thinking focused on deciding what to believe or do . . ." (p. 14). One of the ways in which members of the general public may differ as to how they perceive and evaluate low-level risks is the degree to which they are disposed to think and reason critically about risks in general and the specific risk in particular. Rudd, Baker, Hoover and Gregg (1999) defined the disposition to critical thinking as: "A reasoned, purposive, and introspective approach to solving problems or addressing questions with incomplete evidence and information and for which an incontrovertible solution is unlikely" (p. 5).

Facione (1998) argues that on order to think critically, individuals employ, through pre-disposition or through learned development, to a greater or lesser degree, the seven constructs of critical thinking: analyticity, self-confidence, inquisitiveness, maturity, open-mindedness, systemacity and truth seeking (Facione, 1992).

In 1990, a Delphi report was published which documented efforts by 46 professionals in the academic field to develop a working framework in which to evaluate critical thinking skills and dispositions (Facione). While there has been much debate dealing with the subject specificity of effective critical thinking (Ennis, 1989; McPeck, 1990; and Ennis, 1990), the designation of critical thinking disposition and skill addresses this by acknowledging that there is a relationship between the two. Critical thinkers are purposive and understand the issues (Paul & Elder, 2001). A strong critical thinking disposition can be likened to a computer existing in the sleep mode; it is always on and can quickly be accessed without having to reboot the whole system.

To date, critical thinking research efforts have primarily focused on influencing skills in the instructional setting. However, recent research has begun to evaluate critical thinking disposition as it pertains to professional development and evaluation (Smith-Blair, 2000). This is important because as Ennis (1990) states, “Although they overlap, school-subjects knowledge and everyday knowledge are not identical” (p. 15).

Smith-Blair’s study focused on the disposition of thinking critically for critical care nurses during orientation (2000). The critical care nursing profession is made up of daily scenarios that require problem-solving skills utilized in the decision-making process. Dealing with these day-to-day scenarios is addressed specifically by Facione in the 1990 Delphi report.

> The cultivation of these dispositions is particularly important to insure the use of CT skills outside the narrow instructional setting. Persons who have developed these affective dispositions are much more likely to apply their CT skills appropriately in both their personal and their civic life than those who have mastered the skills but are not disposed to use them (p. 26).

Based upon the Delphi report, the dispositional components of critical thinking that characterize the "critical spirit" are inquisitiveness, open-mindedness, analycity, systemacity, confidence, truth seeking and maturity. This is similar to the need for cognition that has been examined in the context of message analysis and has utilized scales which measure an individual's need for cognition (NC) (Cacioppo & Petty, 1982). These scales have measured the likelihood and enjoyment of being cognitively involved.

Utilizing a critical thinking disposition inventory as a measure of message involvement, and subsequent attitudes and behaviors, is a natural extension of the previous research (Smith-Blair, 2000).The implication of framing messages about risks that activate critical thinking disposition strengths may in fact reduce the effect of mass media reporting that is "plagued by the omission of important information, too much emphasis in crises and conflicts" (Archibald, 1999, p. 27). These frames, emphasizing certain aspects or experiences over others often impacts public understanding about an issue. The role of the mass media is to inform, and due to its competitive nature, sometimes to titillate through emphasizing crises and conflicts that can result in disproportionate level of understanding between factual and believed attitudes toward a risk. By utilizing their critical thinking skills, the general public can try to make sense of what is known, and what is not known, and arrive at some version of the truth as they understand a given risk through using various communications products, many which attract our attention on a daily basis.

People are basically habitual. We have schedules and we follow them. This includes receiving information about the world around us (Gerbner, 1973). For example, we consistently utilize the same channels in which to receive our daily dose of information. For example, we may watch the 6:00 pm news, read the morning paper or log on to the internet. This activity is factored into our daily lives and it seldom varies. People make some determination about the credibility of the source and decode the information provided by this source within a framework that has already been established (Heath & Abel, 1996). We rely on these source(s) to alert us to problematic situations and to interpret them for us. When issues of trust or source credibility arise, or when competing sources of information are available, information is often misinterpreted (Williams & Olaniran, 1998).

We, of course, bring our existing attitudes to the process. Additionally, we are not always singularly attentive to the source. It is not uncommon to receive information while engaged in another activity such as watching the news and making dinner. Thus, we are open to distractions from phones, family members, etc. while engaged in receiving the message. Our level of decoding the information can be quite intense or only peripheral (Cacioppo & Petty, 1979).

According to Facione (1990) "A good critical thinker is habitually disposed to engage in, and encourage others to engage in critical judgment" (p. 24). Outlined below is how critical thinking disposition can affect risk assessment.

Analycity Risk Application

Analycity targets the disposition of being alert to potentially problematic situations and anticipating possible results or consequences (Facione, Facione, & Sanchez, 1994a). This construct is pivotal in decoding messages about risk. The disposition to receive a message and analyze its relevance to one's personal and immediate situation, as well as apply the standard to the good of society involves cognitive processes that move information through the decision-making process to reach an appropriate resolution. Risks involve preventive, versus reactive, behavior and typically evolve over long periods of time. The lack of this disposition has the potential of not only preventing the recipient from analyzing the current message, but even perhaps ignoring future messages on the topic. Once a determination has been made that the topic is either not personally relevant or too hard to deal with, future efforts to promote a certain behavior may fall by the way-side as one's previous experience of dealing with the information was not positive. If the risk is still low-level enough, there may not be the need to promote a higher degree of effort. However, peer pressure, or an increasing awareness over a period of time of the risk may heighten one's anticipation of the possible results or consequences.

Self-Confidence Risk Application

Self-confidence is the level of trust one places in ones own reasoning process (Facione, Facione, & Sanchez, 1994a). Those disposed to high-levels of self-confidence are able to receive the message, and take the information about an unknown or little known risk and apply decision making protocols by adapting the current risk factors to a parallel situation and from which one feels confident that a logical decision can be made. There is an perceived level of control over the situation regardless of the context. Through previous experience, one can be confident that a reasonable decision can be made without all the facts being immediately accessible. Those lacking high levels of self-confidence may unable to rationally make a suitable determination and thus not even attempt to engage in the decision making process.

Inquisitiveness Risk Application

An inquisitive person is one who values being well informed even if the immediate payoff is not directly evident. There is an innate curiousness about acquiring information and which motivates the message recipient to learn more (Facione, Facione, & Sanchez, 1994a). Those highly disposed on the inquisitive construct may become information seeking to look for additional sources or content on which to base a decision whether it be from the mass media or through interpersonal channels. There is a need to know that outweighs even the value of the information. Those not highly disposed on this construct may make a decision based solely on the information at hand or based upon the credibility of the source of information. The recipient of the risk information may become more informed but unmotivated as the message lacks personal relevancy and there is little perceived control about the outcome by the message recipient.

Maturity Risk Application

Maturity addresses cognitive maturity, and mature thinkers are disposed to approach problems, inquiry and decision making realizing that some situations have more than one plausible option and that decisions must sometimes be made without the benefit of having all the relevant information about the situation (Facione, Facione, & Sanchez, 1994a). One disposed to use the maturity construct can take introductory or partial information provided in a message and reach a decision about the topic by comparing and contrasting similar situations. Those not highly disposed on this construct may seek input and validation from others. If there is not a lot of information available, the information process becomes stalled and no action is taken.

Open-Mindedness Risk Application

Open-mindedness addresses the state of respecting the right of others with differing opinions (Facione, Facione, & Sanchez, 1994a). Those who are strong on the open-mindedness construct may welcome new information and engage in the decision making process. Those not strong on the open-mindedness construct may ignore the information thereby placing mental barriers in the path of new information. Often, the validity of the information is evaluated on the credibility of the source of the information rather than the content of the message.

Systemacity Risk Application

Systematicity targets the disposition to being organized, orderly, focused and diligent in seeking information (Facione, Facione, & Sanchez, 1994a). Those highly disposed to systemacity may overcome the hurdle of not knowing. Risk messages present a challenge that systematically disposed people consider challenging. The act of achieving knowledge may be more rewarding than gaining knowledge. Those not disposed to systematicity may lose interest quickly and be overcome by the challenge of problem solving and decision making.

Truth-Seeking Risk Application

Truth-seeking thinkers are those eager to seek the truth even if the results do not support one's own interests or preconceived opinions (Facione, Facione, & Sanchez, 1994a). Those highly disposed to be truth seekers are willing to put aside initial negative reactions to information. They are purposive in their evaluation of information and are determined to get to the core of the issue. They are intent on gaining knowledge about the object. Those not highly disposed to truth seeking may fall into one of two groups in terms of receiving messages. The first group may already concur with the information in the message and have their views reaffirmed. The second group may not concur with the information in the message and nothing in the message can persuade them that there is any reason to consider an alternative view.

While the standard for critical thinking disposition evaluation instrumentation has been the California Critical Thinking Disposition Inventory (Faciaone, Facione, & Giancarlo, 2000), the CCTDI is not without its problems, specifically in the area of subconstruct reliability (Moore, Rudd, and Penfield, submitted for publication). An alternative instrument that collapses the seven constructs discussed above into the three constructs of innovativeness, engagement and maturity, is the Florida Critical Thinking Dispositions Scale (FCTDS) that was used in this study. Early reports concerning the FCTDS have shown higher levels of reliability for the subconstructs (Ricketts, 2003) while maintaining a high level of reliability for the overall instrument.

These FCTDS subconstructs were developed incorporating the same dispositional dimensions of critical thinking as those that were developed by Facione (1990) and reported in the Delphi study. A description of the FCTDS follows:

- The Engagement subconstruct encompasses the analycity, self-confidence, and systemacity CCTDI subconstructs and measures the predisposition to looking for opportunities to use reasoning; anticipating situations that require reasoning; and confidence in reasoning ability.

- The Innovativeness subconstruct encompasses the inquisitive and truth-seeking CCTDI subconstructs and measures the predisposition to be intellectually curious and wanting to know the truth.

- The Maturity subconstruct encompasses the maturity and open-mindedness CCTID subconstructs and measures the predisposition to being aware of the complexity of real problems; being open to other points of view; and being aware of one's own and others biases and predispositions.

Based on the above, it follows that most individuals' evaluation of and sensitivity to the risk they associate with the low-involvement risks could be affected by both their attitude toward the specific risk as well as the degree to which they are disposed to use logic and reasoning skills to make a cognitively informed, as opposed to purely affective response.

Moving from Affect to Action

Some environmental scenarios come with built-in symbols, such as water pollution, as a result of chemical dumping or an oil spill but many low-involvement risks, such as invasive species, do not. The responsibility of dealing with these low-involvement environmental risks lay with "someone else." Because "someone else" is in charge and because we have so little control, these risks merit little attention and in fact, we may not even be aware of many of the specific details that explain or accompany these risks. It must be kept in mind though that these low-level risks can become much more salient if circumstances change. For example if an invasive species overtook an ecosystem upon which we relied to earn a living, the issue would become more salient.

Dunwoody and Nuewirth (1991) state that "information may have its greatest impacts on such intermediate variables as knowledge and attitudes, which in turn will influence behavior" (p. 15). Attitudes can be defined as "evaluative tendencies regarding some feature of the environment and can typically be phrased in terms of like and dislike and favor and disfavor" (Eagley & Chaiken, 1993). According to Sjoberg, (2000) ". . . attitude is a crucial factor in risk perception " (p.9). In terms of risk, the professionals who are involved with risk assessment use a technological approach risk wherein the risk is perceived as the likelihood (or expected frequency) of an (adverse) specified consequence (Kemp, 1993). This level of cognition of the attitude object and salience with the attitude object determines their attitude toward the attitude object.

Cacioppo and Petty (1979) defined attitude as an enduring belief toward an attitude object. Attitude objects can exist in multiple layers. For example, one may have an attitude toward the environment as a macrocategory and variations of this attitude toward specific attitude objects within that framework such as recycling or invasive species (Ungar, 1994). Additionally, self-reported environmental attitudes tend to reflect socially desirable outcomes (de Oliver, 1999). However, analysis of behavior associated with the attitude does not always produce the level of results one would expect based on the reported attitudes.

Risk communicators who are trying to inform the public about the invasive species issue and the steps that can be taken to halt the invasion of a specific species develop materials that intend to effect a change in the public's behavior. Ungar (1994) states that ". . . the environment is a domain in which attitudes do not predict behaviors very well"(p. 288). Individual attitude-to-behavior links may fail to focus on the collective actions being gauged in environmental assessments because the environment is a multi-dimensional domain; a macrocategory.

Erikson and Tedin (2001) find that while change in behavior is possible, attitudes are mostly stable over extended periods of time. Ajzen (1988) states that attitudes are comprised of cognitive, affective and conative components and that three components should correlate with each other as they underlie the same attitude.

"Cognitive responses reflect the perceptions of, and information about the attitude object" (Ajzen, 1988, p. 5). Cognitive responses are expressions of beliefs. Fishbien and Ajzen (1971) found that we form beliefs about an object by associating it with certain attributes which are either positive or negative. Affective responses are evaluations of and feelings toward an attitude object. Connotative responses are comprised of behavioral inclinations towards an attitude object.

Fishbien and Azjen moved away from treating these three response tendencies as equally interlaced variable and moved toward viewing them as separate constructs. They then termed them attitude toward the behavior, subjective norm, and perceived behavioral control. Using this construct they developed the Theory of Reasoned Action (1975) and subsequently the Theory of Planned Behavior (1981). According to the Theory of Reasoned Action, attitudes follow reasonably from beliefs that people hold about the attitude object and intentions and actions follow from these attitudes (Ajzen, 1988). Thus, consistent behaviors should occur across a variety of situations.

Beliefs about outcomes are based upon a certain behavior, perceived expectations of others toward the behavior and perceived level of control over the behavior. Based upon the Theory of Planned Behavior (TOPB), behavioral beliefs produce a favorable or unfavorable attitude toward the behavior; normative beliefs result in perceived social norms toward the behavior and control beliefs address the level of control one has in performing the behavior (1991). An expectancy value formulation can be used to describe the relationship between the theory's three major predictors and their underlying beliefs and can be expressed as the aggregated set of beliefs as described by:

$$\sum b_i s_i$$

where b denotes the belief strength and s denotes the associated scale value to the belief (outcome evaluation, motivation to comply and level of control).

Favorable attitudes, strong subjective norms and greater perceived control should result in the intention to perform the behavior. Given the opportunity, people should carry out the behavior. Therefore, as the model predicts, intention is an antecedent variable of behavior (Ajzen, 2001). However, because some behaviors have economical concerns or other limiting factors, it is useful to consider perceived behavioral control in addition to intention (See Figure 2-1). For example, it is desirable that homeowners who design environmentally friendly landscapes use native vegetation and not use non-native plants, such as bamboo, that can potentially spread and become invasive.

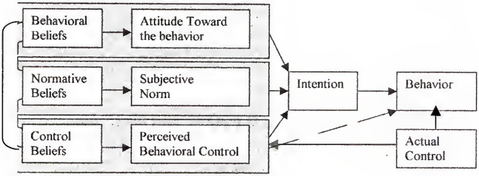

Figure 2-1. Theory of Planned Behavior Model (Ajzen, 2001).

Environmental issues parallel to the invasive species issue have been investigated utilizing Ajzen's and Fishbien's (1971) Theory of Planned Behavior to predict behavior such as recycling (Cheung, Chan, &Wong, 1999). According to this theory, human behavior is guided by three considerations: beliefs about outcomes of a behavior and evaluation of these outcomes (behavioral beliefs), beliefs about what others believe and do (normative beliefs), and beliefs about how much one's actions can influence the outcome (control beliefs). Behavioral beliefs produce an attitude toward a behavior. Normative beliefs result in a perceived social or peer pressure. Control beliefs result in perceived behavioral control. Collectively, these interpretations can lead to the intention to behave in a specific manner. "As a general rule, the more favorable the attitude and subjective norm, and the greater the perceived control, the stronger should be the person's intention to perform the behavior in question"(Ajzen, 2001, p. 1). Much has been written and models, theories and scales have been developed to aid in understanding individuals' reasons for adopting (or not) certain environmental behaviors. Among the better-established models is the Specific Responsible Environmental Behavior Model (Coettrel & Graefe (1997).

The Model of Specific Responsible Behavior (see Figure 2-2) utilizes a step-ladder approach based upon the Model of Responsible Environmental Behavior (Hines, Hungerford & Tormera, 1986). At step one, two background variables, demographics and practical experiences lead to level two variables. At step two are general environmental variables (environmental concern, verbal commitment, perceived knowledge of ecology).

At step three are the knowledge of issues specific variables (issue specific, awareness of consequences and personal commitment to issue resolution). Several theorists (Fishbien & Azjen, 1975; Ajzen & Fishbien, 1977; Herberlein & Black, 1976) state that specific action variables are better predictors of behavior in specific issue situations. At step four, situational factors are the variable most predictive of the specific responsible environmental behavior although this has not always been borne out by research (Cottrell & Graefe, 1997).

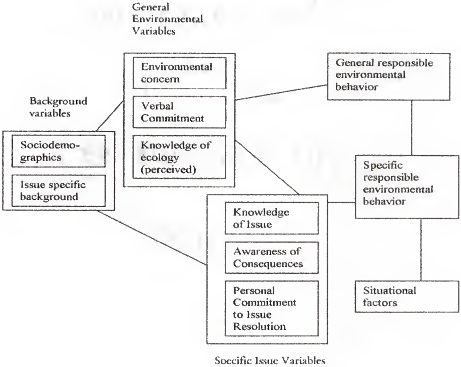
General Environmental Variables
Environmental concern
Verbal Commitment
Knowledge of ecology (perceived)
Background variables
Sociodemo-graphics
Issue specific background
General responsible environmental behavior
Specific responsible environmental behavior
Knowledge of Issue
Awareness of Consequences
Personal Commitment to Issue Resolution
Situational factors
Specific Issue Variables

Figure 2-2. Model of Responsible Environmental Behavior (REB) and its extension to the framework of Specific Environmental Behavior (Hines, Hungerford, & Tomera, 1986).

Tarrant (1997) suggests that the failure to recognize the influence of external factors on behavioral predictions may contribute to the problem of predicting behaviors based upon attitudes. Weigel (1976) argues that assessment of external factors such as situational dynamics are imperative in assessing attitudes. Blamey (1998) argues that the activation of norms of helping is most likely when an actor is aware of the positive consequences a behavior would have for an object in need and ascribes responsibility to herself or himself for helping" (p. 677). Blamey further argues that environmental behavior is based on group dynamics. Successful changes in behavior come about not because one person is behaving in a certain way, but because a group is behaving that way.

The TOPB addresses the attitude and intention development that addresses a specific behavior versus the attitude toward an overall issue that supports the situational specific characteristic. For example, in terms of the invasive species issue, the TOPB model would be used to assess an individual's attitude toward taking a specific action; not the attitude the individual holds toward the invasive species issue in general.

Utilization of TOPB in designing interventions is useful. Due to the differences that exist between experts and the general public as it pertains to a given risk, the approach to informing the public about the risk may miss the intended mark entirely. Furthermore, the level of cognitive involvement with the issue, and manipulations developed to address the varying levels of cognitive involvement may be improved by understanding the belief and attitudes held by the public.

Ajzen's (2001) model provides a process whereby one can investigate the relationship between beliefs and attitudes toward a given object. Beliefs that are accessible are initially determined. This knowledge is critical in developing relevant information regarding a low-involvement topic such as the invasive species issue. Related environmental research that targets preventive behavior, such as recycling, has found that assessment of one's attitude toward a specific act was found to be a significant predictor of behavioral intent and has been found to be more directly related to behavior than is general attitude toward the related issue (Bodero, 1995; Taylor & Todd, 1995; Cheung, Chan, & Wong, 1999).

Additionally, studies have shown that peer support (subjective norm) can initiate and sustain a given behavior (Oskamp, 1991; Burn 1991; Hopper & Nielsen, 1991; and Schultz, Oskamp, & Mainieri, 1995). Alternatively, Vining and Ebreo (1990) found that social reasons were not necessarily a good predictor. Trafimow and Finaly (1996) have found that there is a greater correlation between attitude and intention than subjective norm and intention in a meta-analysis.

The predictive ability of the subject norm factor may be reflective of the attitude toward the overall issue. Issues with high visibility and established in the public psyche, may result in subjective norms that reflect this level of generality. Other, low-involvement issues would not be well enough established for a subjective norm to exist for either the overall issue or the specific behavior. However, cognitively involved individuals may perceive a higher subjective norm in relationship to the behavior via their systemic processing and evaluation.

Perceived control has been found to be pivotal in environmentally related behaviors. Hines, Hungerford and Tomera (1986) suggest that more effort be devoted to examine control over behavior in predicting behavior. Azjen (2001) addresses the situational aspect of behavior by determining the individual's implementation intention. The individual's implementation intension is a detailed plan specifying where, when and how the behavior will be performed (Gollwitzer, 1999).

To summarize, the literature seems to support the three main assumptions upon which the study was based. The first assumption is that risks are evaluated and ultimately perceived differently by experts and lay people. Low-involvement risks are little known but potentially important risks about which the general public should be informed and take appropriate action. Information may be perceived, or even framed, as positive or negative in order to elicit cognitive involvement pertaining to low-involvement risks. Additionally, in order to evaluate information that can lead to a change in attitude and subsequently a change in behavior, one must be cognitively involved. Critical thinking dispositions vary and the level of this disposition may be a factor in understanding how people form beliefs and perceive their level of control as it pertains to low-involvement risks. Finally, in terms of low-involvement risks, changes in beliefs, or even knowledge about the risk, can be assessed utilizing behavioral frameworks such as the Theory of Planned Behavior model.

CHAPTER 3
METHODOLOGY

Overview

This study utilized the Theory of Planned Behavior (Ajzen, 1991) framework to examine the relationships between subjects' disposition to think critically and exposure to a message framed to focus on the risks or benefits of engaging in a specific low-involvement environmental behavior. The behavior under scrutiny in this study was the respondents' willingness to form the intent of taking one's car to a commercial carwash during the next lovebug (an insect) season.

Lovebug populations are a somewhat benign invasive species that are typically found flying along Florida's major roads during the months of May and September in Florida. The lovebugs are frequently struck by the automobile resulting in lovebug remains being smashed onto the cars' grills, hoods and windshields. The lovebugs are highly acidic and if they are not removed from painted areas of the car, the lovebug remains "eat" the paint. To construct an appropriate situation for use in this study, a deception message frame stated that washing one's car at home to remove lovebugs may have a potentially negative impact on the ladybug population. The message frame also stated that taking one's car to a commercial carwash negated this negative impact while still allowing the car owners to maintain their automobiles.

This behavior was selected for two reasons. First, the respondents live in Florida and it is well known that lovebugs are an invasive species that are a problem for automobile owners during the months of May and September. Second, the respondents own or have access to an automobile and it would be assumed that they would have a vested interest in maintaining the automobile.

The purpose in developing a deception study was to control for exposure to previous information as well as provide a message addressing a violitional target behavior that would be salient for the broadest range of subjects and for which the subjects would have control. While the respondents were familiar with lovebugs, the respondents had not been exposed to previous information about the potential negative impact upon the ladybug population and the issue had low signal value (see Appendix A for message frames). All three messages were presented as legitimate news stories emanating from the University of Florida's news page on its website.

Subjects' critical thinking disposition, combined with exposure to the risk or benefit message deal with preventing the risk of harming ladybug populations due to improper removal of lovebugs, was expected to influence their subsequent attitude toward the behavior and intent to engage in the behavior of taking one's car to a commercial carwash during the next lovebug season. The present study attempted to contribute further to the theoretical understanding of the attitude-behavior relationships within the context of low-involvement risk behaviors in the following ways:

1. this study assessed the extent to which critical thinking disposition is a factor in influencing intent to engage in a specific action designed to mitigate or reduce a low-involvement environmental risk.
2. this study assessed how critical thinking dispositions influence processing of risk/benefit messages designed to address low-involvement risks and consequently form attitudes and intent toward a desired behavior;
3. this study examined which combination of factors best predict one's attitude and intent to perform the desired behavior toward a low-involvement environmental risk, mitigation of which requires taking a specific violitional action.

Hypotheses

Based on the literature, research questions and the goals of this study, the following hypotheses were developed:

H1: Subjects with high critical thinking dispositions who receive the benefit (positive frame) message will be more likely to intend to engage in the target behavior than subjects with low critical thinking dispositions who receive the same message.

H2: Subjects with low critical thinking dispositions who receive the risk (negative frame) message will be more likely to intend to engage in the target behavior than subjects with high critical thinking dispositions who receive the same message.

H3: Subjects with high critical thinking dispositions who receive the benefit (positive frame) message will form a more positive attitude toward the target behavior than subjects with low critical thinking dispositions who receive the same message.

H4: Subjects with low critical thinking dispositions who receive the risk (negative frame) message will form a more positive attitude toward the target behavior than subjects with high critical thinking dispositions who receive the same message.

H5: For subjects with high critical thinking disposition, attitude toward the behavior, and perceived behavioral control will be the strongest predictor variables of behavioral intent, while subjects low critical thinking disposition, subjective norm and perceived behavioral control would be the strongest predictor variables.

Subjects

To test the hypotheses in the study, a sample of college students attending an undergraduate course (N = 497) were utilized. The subjects were randomly assigned to one of three message treatments (benefit, risk and control).

The respondents each received 17-page survey packets (see Appendix B) that were compiled with the following components in addition to a scantron:

1) Page 1 contained directions on how to complete the survey.

2) Page 2 contained the Informed Consent statement (an additional informed consent statement for the respondent to keep was attached to each packet).
3) Pages 3-5 contained the 30-item Florida Critical Thinking Disposition Scale.
4) Page 6 was one of three message versions that emphasized:
    a. The benefits of complying with the intended action;
    b. The risks of not complying with the intended action; and
    c. A control message outlining the problem and solution with no further emphasis on the risks or benefits of complying with the intended action.
5) Page 7- asked the respondents to list their thoughts about Lovebugs that was used as the target of the behavioral intention.
6) Pages 8-15 contained the 93-item survey comprised of belief statements and direct measures based upon the Theory of Planned Behavior Model (Ajzen, 1991) along with demographic questions.
7) Page 16 contained the debriefing statement.

Research Design

This study was a quasi-experiment utilizing the Theory of Planned Behavior (TOPB) model as the theoretical framework. TOPB studies are designed to examine an outcome, or the respondents' intent to behave in a desired manner after receiving an intervention. A review of the TOPB literature reveals that a randomized subjects, post-test only control group design is the most appropriate research design and was therefore used as the research design for this study (Ajzen, 1991).

TOPB questionnaires are designed following a specific series of steps (Ajzen, 1991; Gollwitzer, 1999). The first step is to use a pilot study to identify accessible behavioral, normative and control beliefs as was done in this study. In step two, and based upon the information generated from the pilot study, an intervention is designed to influence or change the beliefs identified in the pilot. Thus, in step three, a questionnaire is designed that incorporates direct measures of attitude-behavior and belief-based measures. Therefore, based upon the requirements of the model and the requirements of the hypotheses, the following statistical methods were deemed to be the most appropriate for understanding the outcome variable of intent to behave.

1. Factorial ANOVA methods examine the variability between sample means (Agresti & Finlay, 1999). The greater the variability between sample means, the stronger the evidence that the null hypothesis is false. The probability of rejecting the null hypothesis when it is false is a Type II error. However, the power of the test increases as the sample size increases (Cohen, 1988). By limiting the number of groups, the sample size does not violate the assumptions of normal distribution. Additionally, if samples sizes are identical (or close to identical), then moderate departures from standard deviations can be tolerated. This method indicates whether there are significant differences between the groups being compared. Additionally, ANOVAs report interactions and main effects for the independent variables.

2. Multiple linear regression – Standardized regression coefficients do not depend on the units of measurement. The coefficient of multiple determination describes the degree of predictability of the response variable by the collective set of explanatory variables (Salkind, 2000). It is also possible to compare complete and reduced models which allows for examining which coefficients explain the variability.

Even though the statistical methods stated above are appropriate for this research design, there are inherent weaknesses that need to be taken into account in order to form sound results that accurately represent the statistical data.

1. Because the ANOVA methods in and of themselves only specify that the means are different, not which means are different or the strength of the difference, additional analyses are required (Agresti & Finlay, 1999). Additionally, the between-groups estimate of variance tends to overestimate the level of variance when the null hypothesis is false. Bonferroni Confidence Intervals were therefore utilized as this method uses a more stringent confidence level for each interval as well as providing a way to determine where means are significantly different.
2. Extreme deviations from normality – This can occur if the sample size is small, if the population distributions are highly skewed or if the population standard deviations are extreme. This can occur when intact groups are selected for the study. This study was distributed to a large sample (N=497) to address these violations of assumptions.

3. Threats to validity – (Ary, Jacobs & Razavieh, 1996)

    a. If a survey is too long, then the subjects may be become tired, bored and simply not complete the survey. However, the greater the number of items, the higher the reliability. For this study the length of the questionnaire was determined by the pilot study where accessible modal beliefs were identified. The researcher identified the most common topics for use in the questionnaire.

    b. A change may occur in the dependent variables that can be attributed to something other than the independent variables if related events (history) occur during the treatment process. Due to the abbreviated time in which it was administered, history was an unlikely threat.
    c. If the treatment process spans an extended period of time (maturation) then a change may occur in the dependent variables which can be attributed to something other than the treatment process. Because the respondent completed the survey in one sitting, maturation was controlled for.

    d. Mortality, drop-out rate, is also likely to occur if the treatment process spans an extended period of time. Mortality was addressed by offering extra-credit points for completing the questionnaire.

    e. If random assignment to the treatment process does not occur, then differences may occur that can be attributed to groups rather than the treatment process. The subjects were randomly assigned to one of three treatments to normalize the sample distribution and to avoid the occurrence of extreme scores developing in one of the groups.

Instrumentation

Two scales were used in this study. The Florida Critical Thinking Disposition (FCTDS) was used to assess the respondents' critical thinking disposition score. The second scale was based upon the Theory of Planned Behavior model that assesses respondents' beliefs and attitudes toward a specific behavior.

Florida Critical Thinking Disposition Scale

One of the reasons the FCTDS scale developer attempted to develop the instrument was to address reliability issues connected with the existing CCTDI seven-scale instrument developed by Facione and Facione (1992) (Ricketts, 2003). A team of researchers re-evaluated the findings of the Delphi report and identified three dispositions (Innovativeness, Maturity, Engagement) that encompassed the seven outlined by Facione. This three-subconstruct instrument is similar to Facione's seven subconstruct instrument, and the FCTDS was chosen for use in this study to address reliability issues as presented in Chapter 2 (Moore, Rudd & Pennfield, submitted for publication).

The FCTDS instrument consists of 30 items with an overall scale reliability of $\propto = .86$ (Ricketts, 2003). The reliability scores for the subconstruct engagement ($\propto = .90$) and innovativeness ($\propto = .79$) surpassed the reliability scores reported in Facione's Delphi Report for CCTDI (1990). The reliability for maturity ($\propto = .75$) matched the score reported by Facione (1992).

See Table 3-1 for construct reliability scores and means as reported by Ricketts (2003). Score totals for the instrument fall into a range between 30 and 150. For the purposes of this study, however, reliability was an issue which prompted instrument evaluation by way of factor analysis using Principal Axis Component extraction and Orthangonal (Varimax) rotation methods. See Chapter 4 for the factor analyses results.

Theory of Planned Behavior Model

Theory of Planned Behavior instruments are developed by researchers to investigate the likelihood that respondents will perform a specific target behavior (Ajzen, 1991). Based upon the interest of the researcher, these instruments are specifically developed to measure the beliefs and attitudes that respondents hold toward the behavior and therefore there is no established TOPB scale that covers all situations. It is up to the

Table 3-1. Inter-item Consistency Statistics for the FCTDS (Ricketts, 2003).

Item[a]	M[b]	SD	Corrected Item-total correlation	Alpha if item deleted
I-1	4.63	0.73	0.26	0.78
I-13	3.97	1.07	0.29	0.78
I-16	3.65	0.98	0.48	0.77
I-25	4.38	0.95	0.54	0.78
I-28	3.54	1.24	0.57	0.77
I-31	4.01	1.08	0.47	0.77
I-46	4.21	1.02	0.40	0.78
I-49	4.04	0.97	0.48	0.76
I-52	4.43	0.72	0.41	0.78
I-58	3.78	1.18	0.47	0.78
I-59	3.78	1.06	0.55	0.76
M-2	2.38	1.01	0.53	0.71
M-26	2.97	1.24	0.56	0.69
M-29	2.67	1.20	0.44	0.72
M-35	3.14	1.40	0.41	0.73
M-44	2.28	1.36	0.51	0.70
M-60	3.24	1.38	0.50	0.71
E-3	3.41	1.20	0.52	0.89
E-6	4.04	0.96	0.78	0.88
E-15	3.69	0.94	0.56	0.89
E-18	3.85	0.82	0.48	0.89
E-21	4.04	0.90	0.75	0.88
E-24	4.26	0.75	0.60	0.89
E-27	4.26	0.95	0.57	0.89
E-30	3.95	0.96	0.53	0.89
E-33	3.74	1.02	0.50	0.89
E-36	3.57	0.99	0.53	0.89
E-39	4.00	0.94	0.72	0.88
E-42	3.57	1.06	0.64	0.88
E-57	3.17	0.96	0.56	0.89

[a] I = Innovativeness, M = Maturity, E = Engagement

[b] Likert Scale where 1 = low disposition and 5 = high disposition

researcher to develop items that utilize the form and structure that address the beliefs and direct measures of the respondents as outlined by Ajzen (1991). While many TOPB studies have focused on environmentally related behaviors (Cheung, Chan, & Wong, 1999; Bratt, 1992; Boldero, 1995; Taylor & Todd, 1995), none have been found in the invasive species domain. Studies related to the invasive species issue tend to focus on quantifying the potential environmental damage and vectors of dispersal and do not address how these vectors (people) decide to behave in a specific manner (Pimentel, et al., 2001).

For the purposes of this study, lovebugs were chosen as an appropriate invasive species based upon the perception that potential environmental damage due to the improper disposal of this insect was a low-involvement environmental issue with little signal value. The behavior of interest for this study was therefore preventive and violitional in nature, as well as being low-involvement, such that individuals would be directed to properly dispose of a specific invasive pest (lovebug) in a proscribed manner (taking one's car to a commercial carwash). Based upon Ajzen's TOPB design, behaviors are defined in terms of target, action, context, and time elements (2001). The target was to choose to go to the carwash, the action was to remove the lovebugs, the context was the carwash versus at home removal, and the time element was during the lovebug seasons of May and September. Because direct observation of this behavior is beyond the scope of this study, measurement of intent to perform the behavior was used.

Ajzen (2001) states that The Theory of Planned Behavior (TOPB) employs two types of measures: belief based and direct. Belief-based measures provide indirect measures of the constructs. Based upon previous research and the results of the pilot study, beliefs are elicited in order to construct a list of modal accessible beliefs which are the most commonly held beliefs in the research population. Each belief identified in the pilot study is then developed into two–part statements. Accessible behavioral beliefs serve as an indirect measure of attitude toward a given behavior. The beliefs are established by multiplying the behavioral belief strength by the outcome evaluation. The resulting products are summed over all accessible outcomes as exhibited in the equation below:

$$\mathrm{AB} \propto b_i e_i$$

Normative beliefs underlie the normative pressure within a given population. These beliefs are established by multiplying the belief strength by the motivation to comply. The resulting products are summed over all accessible outcomes as exhibited in the equation below:

$$\mathrm{SN} \propto \mathrm{n}_i m_i$$

Control beliefs contribute to the understanding of which factors facilitate or impede being able to perform the behavior. These beliefs are established by multiplying the belief strength by the control belief power. The resulting products are summed over all accessible outcomes as exhibited in the equation below:

$$\mathrm{PBC} \propto \mathrm{c}_i p_i$$

Because belief-based measures are indirect measures of the underlying constructs, these measures may not exhibit internal consistency and are not held to the same reliability standard as direct measures (Ajzen, 1991). While belief-based measures are designed to measure attitude toward a behavior, there is no assumption that these beliefs are internally consistent as the beliefs can potentially produce both positive and negative outcomes.

Based on the pilot study, direct measures were developed for the constructs of intention, attitude toward the behavior, subjective norm, perceived behavioral control and actual control. Direct measures were assessed by asking respondents to evaluate each on a set of scales. These scales were adapted from the TOPB literature and consisted of five-point semantic differential scales anchored by bipolar adjectives and were presented in nonsystematic order with other constructs. (Osgood, Suci, & Tannenbaum, 1957).

Independent Variables

The major independent variables in this study included three levels of message treatment (benefit, risk and control) and two levels of critical thinking disposition level (high or low).

Message treatment

Three messages were developed to test the hypotheses. Two of the message frames focused on either the benefits or the risks associated with taking preventative and violitional action toward reducing the threat posed by a specific invasive species, the lovebug. Taking one's car to a commercial carwash during lovebug season was presented as the most desired violitional behavior. The benefit message presented the potentially positive results associated with choosing to remove the invasive species (lovebugs) at a carwash versus washing the car at home. The risk message presented the potentially negative results associated with not going to a carwash to remove the invasive species (lovebugs). The control message simply defined the issue. A message was embedded into each questionnaire and the respondents were randomly assigned to receive one of the three message treatments.

Manipulation checks were conducted to assess whether the respondents felt the message they received was believable and if the message was factual. Additional analysis was conducted to assess whether the respondents felt the message was presented in a benefit or risk frame.

Florida Critical Thinking Disposition Scale

The researcher used the Florida Critical Thinking Disposition Scale (FCTDS) (Ricketts, 2002). Each respondent completed the FCTDS instrument. Each questionnaire was pre-numbered. A scantron with a corresponding number was attached to each questionnaire for tracking purposes (results reported in Chapter 4).

Dependent and Moderating Variables

Dependent and moderating variables in this study were derived from the TOPB framework. The moderating variables included attitude toward the behavior and behavioral beliefs; subjective norm and normative beliefs; and perceived behavioral control and control beliefs. Beliefs are assumed to influence attitude toward the behavior but they are not assumed to determine the direct measure of the behavior.

To assess whether new attitudes formed in response to the intervention are effective, it is necessary to assess whether individuals are in fact capable of carrying out their newly formed intentions and thus ensuring that a strong link exists from intentions to behavior. This was accomplished by asking the respondents to form an implementation intention. The implementation intention consisted of having the respondents form a specific plan detailing when, where and how the behavior (taking the car to the carwash) would be performed. Formulating such plans make it easier for people to perform the intended action (Gollwitzer, 1999).

Summated Indices

For the purposes of this study, the respondents read a message and then were asked to respond to a series of belief-based and direct measure questions as discussed below. The belief-based responses and direct measure responses for each construct were then averaged to create subscale indices for each construct. A summated index value comprised of the beliefs and direct measures for each construct was developed and the basic structure of the TOPB model was corroborated by correlational analysis (see Chapter 4).

Belief-based Measures

A pilot study was conducted to ascertain the subjects accessible behavioral, normative and control beliefs toward the low-involvement invasive species issue using taking the car to a commercial carwash as the desired behavior. The population of interest was comprised of college students who own or have access (parents, roommates) to automobiles.

According the TOPB framework, these beliefs provide the "cognitive and affective foundations for attitudes, subjective norms and perceptions of behavioral control" (Ajzen, 2001, p.1). While these beliefs are not a direct measure of the attitude toward the behavior, they can be used to measure indirect belief-based measures of the construct. In accordance with the procedures specified by Ajzen (2001), interventions are developed to influence and change beliefs. For each belief a set of five scale items were developed to assess the beliefs. Each item was comprised of two questions to assess: 1) behavioral belief strength and behavioral outcome evaluation; 2) normative belief strength and motivation to comply; and 3) control belief strength and control belief power item. Examples of these scale items are presented in Table 3-2.

Direct Measures

A direct measure of attitude was determined using scale items to measure attitude toward the behavior, subjective norm and perceived behavioral control. Based upon the information derived from the pilot study, direct measure scales were developed from the TOPB framework to assess attitude toward the behavior, subjective norm and perceived behavioral control (see Table 3-3). Ajzen (2001) states that the intent to perform a behavior (*BI*) is comprised of attitude toward the behavior (*AB*), subjective norm (*SN*) and perceived behavioral control (*PBC*) as illustrated in the equation as follows:

$$B >> BI >> (AB + SN + PBC) = w1AB + w2SN + w3PBC$$

Behavioral Intention as a Dependent Variable

Within the TOPB framework, behavioral intention is a strong predictor of behavior and is used as an dependent variable when the behavior itself cannot be observed and consequently measured (Ajzen, 1991). Behavioral intent was determined in this study by utilizing a series of five items developed to assess direct measures toward the invasive species (lovebugs). See Table 3-4 for examples of the scale items used to assess intent.

Table 3-2. Examples of Belief-Based Measures scale items.

Behavioral Beliefs Scale Items[1]

Based on what I just read, taking my car to a commercial carwash to remove lovebugs during the next lovebug season will make a positive contribution to the environment.

extremely likely 1 2 3 4 5 extremely unlikely

Making a positive contribution to the environment is

extremely bad 1 2 3 4 5 extremely good

Normative Beliefs Scale Items[2]

Based upon what I just read, my friends expect me to take my car to a commercial carwash to remove lovebugs during the next lovebug season

I should 1 2 3 4 5 I should not

Generally speaking, how much do you want to do what your friends think you should do

not at all 1 2 3 4 5 very much

Control Beliefs Scale Items[3]

I expect that my studies at the University of Florida will place high demands on my time during the next lovebug season.

strongly agree 1 2 3 4 5 strongly disagree

The demands from my studies in terms of my time during the next lovebug season will make it harder for me to take my car to a commercial carwash.

much easier 1 2 3 4 5 much more difficult

---

[1] The first item is a behavioral strength item and the second item is an outcome evaluation item.

[2] The first item is a normative belief strength item and the second item is a motivation to comply item.

[3] The first item is a control belief strength item and the second item is a control belief power item.

Table 3-3. Examples of Direct Measures' Items

Attitude toward the behavior

My attitude toward taking my car to a commercial carwash during the next lovebug season is:

unfavorable	1	2	3	4	5	favorable
bad	1	2	3	4	5	good
unpleasant	1	2	3	4	5	pleasant
negative	1	2	3	4	5	positive
unenjoyable	1	2	3	4	5	enjoyable

Subjective norm

Based upon the information I just read, taking my car to a commercial carwash to remove the lovebugs during the next lovebug season is:

unexpected	1	2	3	4	5	expected
undesirable	1	2	3	4	5	desirable
not required	1	2	3	4	5	required
not mandatory	1	2	3	4	5	mandatory
unacceptable	1	2	3	4	5	acceptable

Perceived behavioral control

Based upon the information I just read, taking my car to a commercial carwash to remove Lovebugs during the next lovebug season is:

easy to do	1	2	3	4	5	hard to do
convenient	1	2	3	4	5	inconvenient
unusual behavior	1	2	3	4	5	usual behavior
expensive	1	2	3	4	5	inexpensive
unlikely	1	2	3	4	5	likely

Table 3-4. Examples of Behavioral Intent Items.

Based upon the information I just read, I intend to take my car to a commercial carwash to remove the lovebugs during the next lovebug season.

Extremely unlikely	1	2	3	4	5	Extremely likely

I plan to reduce the amount of acidic buildup found in the soil from washing lovebugs off of vehicles at home by taking my car to a commercial carwash during the next lovebug season.

Definitely false	1	2	3	4	5	Definitely true

Procedures

A pilot study was conducted to identify accessible beliefs relevant to college students in accordance with the procedures outlined by Ajzen (2001) (see Appendix C). Additionally, the message versions developed as interventions were evaluated during the pilot study.

A pilot test was administered to identify accessible beliefs and to evaluate message effectiveness in a class where the researcher had no affiliation (N = 73 students). Completed questionnaires were culled based on whether students had taken courses with the researcher in the current or previous semesters.

The pilot test questionnaire was administered according to the following format.

1. The subjects were first asked to list their thoughts about the lovebugs. This step was included to activate the respondents' accessible beliefs but was not used as a belief measure.

2. The subject read one of three messages. Two distinct messages were framed to emphasize either the benefit or risk associated with the lovebug issue. A third control message presented the information.

3. The subjects were asked to respond to pre-developed scale items for both direct and belief-based measures based upon the language recommended in the TOPB model using a Likert Sale ranging between 1(strongly disagree) to 5 (strongly agree).

A univariate ANOVA was conducted using a single dependent variable Likert type item asking if the message had been presented negatively (= 1) or positively (= 5). The ANOVA was significant, F (2, 71) = 3.25, p=.02, and the means of the different message versions followed the predicted pattern of respondents receiving the benefit message having the most positive perception followed by the respondents receiving the control message (see Table 3-5) The respondents who received the risk message had the most negative perception.

Table 3-5. Means Table for the Effect of Respondents' Perception of Message Frame Based on Likert Scales of 1 = negative and 5 = positive.

Message frame	(N)	Mean	(SD)
Benefit frame	34	4.37	.80
Control frame	25	3.0	1.3
Risk frame	14	1.50	.41

Based upon TOPB procedures outlined by Ajzen (2001), the pilot study contained two statements for each of the following belief subconstructs:

1. behavioral belief strength and behavioral belief outcome;
2. normative strength and motivation to comply
3. control strength and control belief power.

Eleven TOPB statements were used to assess the direct measure construct for attitude toward the behavior; five TOPB statements were used to assess the direct measure construct for subjective norm; and seven TOPB statements were used to assess the direct measure construct for perceived behavioral control. Additionally, five statements were used to assess behavioral intent. These statements, using bipolar adjectives were developed as Likert Scale items ranging in value between 1 (negative, unimportant) and 5 (positive, important).

The results from the pilot test to identify accessible beliefs were satisfactory in that they provided information about the respondents' modal beliefs toward the target behavior, especially in terms of the respondents' perceived behavioral control toward the time and money issues associated with taking one's car to a commercial carwash. Studies have shown that similar environmentally supportive actions are limited by college students in terms of time and money (Smith-Sebasto, D'Costa, 1995). Correlational analysis also showed that the constructs were also significantly related to intent. (see Table 3-6).

Table 3-6 Pearson Correlations Between Attitude Toward the Behavior (AT), Subjective Norm (SN), Perceived behavioral Control (PBC), and Intent.

AT	--			
SN	.72**	---		
PBC	.42**	.65**	---	
Intent	.44**	.57**	.62**	---

$**p < .01$

Based upon the results of the pilot test, a final questionnaire was developed and administered to a sample of 497 college undergraduates. The questionnaires, and accompanying scantrons, were pre-numbered. The surveys were then compiled for distribution. Attached to each packet was a set of instructions for completing the questionnaire.

Data Analysis

The data analysis for this study was conducted using SPSS 10.0 for windows PC and is comprised of:

1. correlational data to measure the strength of the relationships between thevariables;

2. ANOVA models to determine differences for high and low critical thinking dispositions; and

3. Multiple linear regression to determine behavioral intent using high and low critical thinking dispositions and the Theory of Planned Behavior subconstructs.

CHAPTER 4
FINDINGS

Descriptive Data

Utilizing the Theory of Planned Behavior (TOPB), the purpose of this investigation was to examine the potential effects of critical thinking disposition and message version (benefit, risk or control) on the intent to engage in a low-involvement environmental behavior: taking one's car to the commercial carwash during lovebug season. In keeping with the TOPB framework and research hypotheses, intent to perform the desired behavior and attitude toward the behavior were the primary dependent variables.

The 124-item questionnaire for this investigation was administered to a sample of college undergraduates. A total of 497 surveys were distributed and 478 were returned. Cases were removed based on the following criteria:

1) The respondent had not completed the survey (N = 13).
2) The respondents neither owned nor had access to a car (N = 2).
3) The respondent indicated that she/he had been enrolled in one of two courses where they may have been exposed to the pilot study used to construct the final instrument. Because the respondents were not asked when they had been enrolled in either of these two classes, all the respondents who indicated that they had previously taken one or both of these classes were removed from the overall sample (N=33).

4) The respondent was graduating within the semester in which the study ran. This was important because four of the belief-based measures regarding one’s perceived level of control in being able to take one’s car to a commercial carwash during the next lovebug season focused on the demands from one’s studies. Due to the early May graduation date, the issue of demands from one’s studies would no longer be relevant (N = 19).

This resulted in a final *N* of 411 subjects. General demographics were obtained from the sample for gender, age, and college major. There were 221 male (53.5%) respondents and 183 female (44.3 %) respondents. The majority of respondents were 18-19 years old (54.7%) followed by respondents 20-21 years old (35.4%). The remaining respondents were 22 years old or older (9.9%).

Respondents were classified by majors. There were 120 social sciences majors (29.3%), 135 business majors (32.7%), 124 science majors (30%), 12 arts majors (2.9%,) or 19 subjects who classified themselves as other (4.6%).

Manipulation Checks

Manipulation checks were conducted to evaluate the two independent variables used in this study. Based on the results from the pilot-study, three messages were developed using different frames to present the information about the lovebug situation. Additionally, the Florida Critical Thinking Disposition Scale (FCTDS) (Ricketts, 2003) was utilized to determine the respondents’ levels of critical thinking disposition.

Message Version

Three different versions of the same message were used in this study. One was presented as a benefit message, one as a risk message and one as a control message. All three messages were presented as a print-off of a news article emanating from the University of Florida's web site. To assess face and construct validity issues, two items were used to assess the "believability" and "factual" nature of the messages used in this study. The means for the two items indicate that overall, on a Likert scale ranging between 1 (not believable, not factual) and 5 (believable and factual), the majority of respondents found the messages (benefit, control, and risk) to be believable and factual (see Table 4-1 for message means).

Table 4-1. Means Table for Message is Believable and Message is Factual using a 1-5 Likert Scale (1 = not believable/not factual and 5 = believable/factual).

Message Believable		N (% N)	Mean	SD
	Benefit Message	139 (35.9%)	3.57	1.3
	Control Message	118 (30.4%)	3.49	1.2
	Risk Message	131 (33.7%)	3.38	1.2
Message Factual		N (%N)	Mean	SD
	Benefit Message	139 (35.9%)	3.49	1.5
	Control Message	118 (30.4%)	3.42	1.2
	Risk Message	131 (33.7%)	3.32	1.2

A univariate ANOVA was conducted using a single dependent variable Likert Scale item: The message presented in this survey about the lovebug population is presented as being: Negative 1 2 3 4 5 positive. The ANOVA was near significant, F (2, 388) = 2.99, p=.052, and the means of the different message versions followed the predicted pattern of respondents receiving the benefit message having the most positive perception followed by the respondents receiving the control message (see Table 4-2). The respondents who received the risk message had the most negative perception.

Table 4-2. Means Table for the Effect of Respondents' Perception of Message Frame Based on Likert Scales of 1 = negative and 5 = positive.

Message Version	N	Mean	SD
Benefit Message	141	3.15	.37
Control Message	120	2.87	.39
Risk Message	130	2.64	.45

Florida Critical Thinking Disposition Scale

As reported in Chapter 3, the 30-item Florida Critical Thinking Disposition Scale (FCTDS) (Ricketts, 2003) was utilized to assess the respondents' level of critical thinking disposition. While this scale is relatively new, previous studies have indicated its usefulness in measuring respondents' critical thinking disposition and the sub-constructs of engagement, innovativeness and maturity. One advantage of using this scale was that the preliminary reports of reliability for each of the sub-constructs matched or exceeded the reported alpha levels for the constructs found in the California Critical Thinking Disposition Scale (CCTDI) (Facione, 1991). A second advantage of using the FCTDS in conjunction with the TOPB (Ajzen, 1991) model was that by using an established shorter scale, it was possible to reduce potential threats to validity due to the fact that instrument was so lengthy that respondents were tempted to not complete the survey (Weisberg, Krosnick & Bowen, 1996).

For the purposes of the present study, reliability analysis of the original 30-item FCTDS) instrument (Ricketts, 2003) using Cronbach's alpha was conducted. Of the 30 items, six items had undergone reverse coding before being entered into the model. The overall scale reliability (∝ = .83), and reliability of the subconstructs of innovativeness (∝ = .73) and engagement (∝ =.85) were acceptable. However, the maturity construct showed lower than anticipated reliability levels (∝ =.34) (see Table 4-3).

Table 4-3. Inter-item Consistency Statistics for the FCTDS Subconstruct Maturity (N = 409).

Maturity Item	Mean[a]	SD	Corrected Item total Correlation	Alpha if item deleted
M - 2	3.66	.92	.18	.29
M - 15	3.15	1.15	.33	.17
M -19	2.72	1.10	.20	.27
M - 22	3.78	1.33	.01	.42
M - 24	3.93	1.10	.20	.27
M - 27	2.56	1.10	.07	.36

[a] Five-point response scale where 1 = strongly disagree and 5 = strongly agree.

Due to the lower than anticipated reliability of the maturity construct, it was determined that a factor analysis should be conducted. To analyze the FCTDS, the 30 items in the scale were entered into the data reduction model using Principal Axis Component Extraction and Orthogonal (Varimax) rotation methods. The criteria used to determine the number of factors to rotate was determined by the scale developers who had specified three subconstructs for this scale. Based on this previous work, the researcher specified that this was a three-factor model (see Table 4-4) (Green, Salkind & Akey, 2000).

Table 4-4. Loading Principle Axis Component Extraction with Orthogonal (Varimax) Rotation for 30-item instrument (Ricketts, 2003) (N=410).

Item[a]	Innovativeness Factor	Engagement Factor	Maturity Factor	Communality
I - 1		.501		.288
I - 5		.540		.466
I - 7	.352			.193
I - 11		.631		.468
I - 12			.429	.197
I - 14	.566			.350
I - 17		.441		.323
I - 25		.388		.164
I - 26		.502		.283
I - 29	.538			.372
I - 30	.497			.357
E - 3	.502			.297
E - 4		.534		.419
E - 6	.490			.361
E - 8	.456			.269
E - 9	.656			.441
E - 10	.577			.408
E - 13	.348			.226
E - 16	.519			.393
E - 18	.594			.379
E - 20	.677			.472
E - 21	.601			.362
E - 23	.673			.452
E - 28	.457			.256
M - 2			.426	.211
M - 15			.492	.243
M - 19			.285	.107
M - 22		.164		3.05E-02
M - 24		.327		.256
M - 27			.166	6.922E-02
Eigenvalue	7.31	2.24	1.61	11.16
% of total variance	22.24	5.14	2.98	30.37
% trace (total var.)	24.36	7.48	5.39	37.24

[a] I = Innovativeness, E = Engagement, and M = Maturity

Research has shown that a communality score of .2 or less indicates that the item should probably be dropped from the scale (Pennfield, 2000). Six items (I- 7, I - 12, I - 25, M - 19, M – 22, and M - 27) had low (>.2) communality scores and were dropped.

As per Pennfield (2000) a second factor analysis was conducted to determine whether these low communality items had skewed the remaining 24 items. Additional analysis indicated that the maturity items (M - 2 and M -15) should also be dropped from the scale based on their communality (see Table 4-5). A third iteration of the data reduction method resulted in removing the remaining maturity item (M - 24) with a communality score of .121. This resulted in a two-factor model as the maturity items had all been removed from the model based on low communality scores and only the innovativeness and engagement constructs contained items. The fourth and final iteration of the two-factor model contained an innovativeness item (I - 26) with a communality score of .193. The item was removed and the final scale was comprised of 20 items with suitable communality loadings (see Table 4-6).

Non-discrete loadings of items onto the factors occurred between the engagement and innovativeness subconstructs. While these subconstructs were established to measure different dispositional approaches to critical thinking, the subconstructs are not inherently mutually exclusive. Previous research (Facione, 1991) has demonstrated that "critical thinking disposition is based upon a conceptual definition rather than one which presents a cleanly faceted model" (p. 4). Due to the nature of a conceptual definition versus a model, items tend to load on more than one construct (Facione, 1991). The innovativeness and engagement subconstructs were retained as separate constructs to measure critical thinking disposition.

Table 4-5. Loading Principle Axis Component Extraction with Orthogonal (Varimax) Rotation for 24- item instrument (N=410).

Item[a]	Innovativeness Factor	Engagement Factor	Maturity Factor	Communality
I - 1		.469		.299
I - 5		.663		.488
I - 11		.612		.432
I - 14	.463			.367
I - 17		.538		.338
I - 26		.411		.239
I - 29	.468			.394
I - 30		.480		.394
E - 3	.399			.321
E - 4		.673		.456
E - 6		.487		.368
E - 8	.405			.275
E - 9	.615			.441
E - 10	.518			.423
E - 13		.367		.232
E - 16		.476		.394
E - 18	.548			.373
E - 20	.699			.492
E - 21	.597			.376
E - 23	.697			.507
E - 28	.388			.254
M - 2			.343	.134
M - 15			.350	.124
M - 24			.529	.323
Eigenvalue	7.03	1.94	1.40	10.37
% of total variance	26.77	5.51	2.91	35.19
% trace (total var.)	29.33	8.11	5.85	43.29

[a] I = Innovativeness, E = Engagement, and M = Maturity

Table 4-6. Loading Principle Axis Component Extraction with Orthogonal (Varimax) Rotation for 20- item instrument (N=410).

Item[a]	Innovativeness Factor	Engagement Factor	Communality
I - 1		.508	.263
I - 5		.677	.508
I - 11		.618	.406
I - 14	.494		.345
I - 17		.523	.332
I - 29	.494		.380
I - 30		.426	.351
E - 3	.430		.294
E - 4		.667	.481
E - 6		.505	.379
E - 8	.397		.260
E - 9	.626		.445
E - 10	.514		.392
E - 13		.376	.221
E - 16		.467	.394
E - 18	.568		.380
E - 20	.675		.460
E - 21	.593		.369
E - 23	.673		.473
E - 28	.413		.254
Eigenvalue	7.00	1.67	8.67
% of total variance	31.42	5.50	31.92
% trace (total var.)	34.57	8.34	42.91

[a] I = Innovativeness and E = Engagement

Follow-up item analysis was conducted Chronbach's alpha statistic. The variability, location, and discrimination of the items were acceptable for both the constructs of innovativeness (r = .85) and engagement (r = .76). The final critical thinking disposition instrument use in this study was comprised of 20 items (r = .89).

Based upon the 20-item instrument, the range of the scores was 20 to 100 where 1 = low score and 5 = high score on each item. Respondents were then categorized at high or low-level critical thinkers on the basis of a means split (see Table 4-7).

Table 4-7. Means, Standard Deviations and Range of Scores for High and Low-level Critical Thinking Disposition for 20-item Instrument (N = 410).

Critical Thinking of Disposition Category	N (%N)	Mean Score	SD	Range Scores
High level	204 (49.8%)	86.22	5.75	79-100
Low level	206 (50.2%)	70.52	6.68	40-78

Note: 20 item Likert scale where 1 = low score and 5 = high

Theory of Planned Behavior Model Constructs

As stated in Chapter 3, indices were created for each of the underlying Theory of Planned Behavior (TOPB) constructs that Azjen (1991) states lead to the intent to behave. The paired statements were developed for each belief (behavioral, normative, and control). According to the TOPB framework, the paired statements to assess these beliefs were comprised of:

1. Behavioral Beliefs = behavioral belief strength and outcome evaluation;
2. Normative beliefs = normative belief strength and motivation to comply; and
3. Control beliefs = control belief strength and control belief power.

Respondents indicated their level of agreement with the statements using a 1-5 Likert scale with 1 being strongly disagree and 5 being strongly agree. As per Ajzen's (2001) framework, these belief statements were subsequently summed to create indices for each belief.

Based upon previous research and the pilot-test, five summated items were developed to measure each belief as discussed in Chapter 3. Based upon the reliability analysis, all five summated items were retained for behavioral beliefs (r = .79) and control beliefs (r = .74). Four items were retained for normative beliefs (r = .72) (see Table 4-8).

Table 4-8. Inter-item Consistency Statistics for Behavioral Beliefs (Ajzen, 2001).

Item[a]	M[b]	SD	Corrected item Total Correlation	Alpha if Item Deleted
Behavioral beliefs scale (∝ = .7965)				
B - 1	3.22	1.40	.6137	.7568
B - 2	2.43	1.48	.4579	.7956
B - 3	2.28	1.53	.5167	.7784
B - 4	2.81	1.42	.6711	.7280
B -5	2.97	1.40	.6442	.7371
Normative beliefs scale (∝ = .7247)				
N - 1	2.05	.98	.5170	.6616
N - 2	1.31	.86	.5747	.6353
N - 3	2.06	1.05	.5113	.6672
N -4	1.64	.99	.4661	.6917
Control beliefs scale (∝ = .7497)				
C - 1	1.83	1.08	.4876	.7167
C - 2	1.81	1.06	.5208	.7033
C - 3	1.69	1.02	.5738	.6830
C - 4	1.68	.96	.4972	.7117
C - 5	1.78	.89	.5005	.7115

[a] B = Behavioral beliefs, N = Normative Beliefs, and C = Control beliefs

[b] Likert Scale where 1 = strongly disagree and 5 = strongly agree

Additional reliability analyses were conducted for the direct measures (see Table 4-9). High internal consistency is desired in the direct measure constructs within the Theory of Planned Behavior model (Ajzen, 1991). The resulting alpha levels produced mixed results. While attitude toward the behavior (r = .92) was strong, subjective norm (r = .77) and perceived behavioral control (r = .74) were not as strong as anticipated. An increased number of items in a scale tend to increase its reliability. Thus, a reliability of .70 can be considered quite high for a scale consisting of five items (Pennfield, 2000). While reliability for behavioral control was moderately low, it was deemed acceptable. Research has shown that time and money are limiting factors for college students (Smith-Sebasto & D'Costa, 1995). Based on this previous research, the items for this study were specifically developed to measure the college student respondents' perceived level of control in terms of money and time.

Based upon previous research and the pilot-test, five items were developed to measure behavioral intent as discussed in Chapter 3. Based upon the reliability analysis (r = .93) all five items were retained for behavioral intent (see Table 4-10). As per the Theory of Planned Behavior framework (Ajzen, 2001) a summated index was developed for behavioral intent.

The basic structure of the TOPB model was corroborated by correlational analysis (Sparks & Shepherd, 1992). Correlations for the summated indices were calculated between the independent variables of attitude, subjective norm, perceived behavioral control and the dependent variable of intent to perform the behavior (see Table 4-11). As anticipated, there was a strong positive correlation between the TOPB constructs and intent to perform the behavior.

Table 4-9. Inter-item Consistency Statistics for Direct Measures.

Item[a]	M[b]	SD	Corrected item Total Correlation	Alpha if Item Deleted
Attitude direct measure scale (∝ = .9274)				
A - 1	3.50	1.15	.8215	.9135
A - 2	3.55	1.07	.7951	.9156
A - 3	3.38	1.19	.8304	.9128
A - 4	3.35	1.24	.6122	.9275
A - 5	3.22	1.19	.7974	.9150
A - 6	3.27	1.11	.7642	.9173
A - 7	3.12	1.10	.6836	.9222
A - 8	3.44	1.14	.6894	.9219
A - 9	3.65	1.06	.6324	.9251
Subjective Norm direct measure scale (∝ = .7728)				
SN - 1	3.33	1.10	.4659	.7565
SN - 2	2.46	1.22	.6210	.7034
SN - 3	2.39	1.19	.5612	.7254
SN - 4	3.64	1.22	.5592	.7263
SN - 5	2.78	1.05	.5185	.7404
Perceived Behavioral Control direct measure scale (∝ = .7267)				
PBC - 1	3.28	1.28	.4536	.6919
PBC - 2	2.73	1.21	.4064	.7020
PBC - 3	2.53	1.07	.2600	.7286
PBC - 4	2.74	1.21	.4023	.7028
PBC - 5	3.60	1.11	.6206	.6578
PBC -6	3.97	1.10	.4689	.6894
PBC - 7	4.07	1.10	.4044	.7020
PBC - 8	4.08	1.09	.3423	.7138

[a] A = Attitude toward the behavior, SN = Subjective Norm, and PBC = Perceived Behavioral Control beliefs

[b] Likert Scale where 1 = strongly disagree and 5 = strongly agree

Table 4 –10. Inter-item consistency statistics for behavioral intent.

Item	M^a	SD	Corrected item Total Correlation	Alpha if Item Deleted
Behavioral Intent measurement scale (∝ = .9282)				
BI - 1	2.77	1.10	.8273	.9088
BI - 2	3.11	1.26	.7900	.9160
BI - 3	2.90	1.25	.8326	.9076
BI - 4	2.62	1.21	.7924	.9153
BI - 5	2.80	1.24	.8134	.9113

[a] Likert Scale where 1 = strongly disagree and 5 = strongly agree

Table 4- 11. Pearson Correlations Between Attitude toward Behavior, Subjective Norm, Control Belief, Actual Control and Behavioral Intention: Taking one□s car to the carwash during lovebug season.

Variable	1	2	3	4
1. Attitude toward Behavior	---			
2. Subjective Norm	.52**	---		
3. Perceived Behavioral Control	.42**	.44**	---	
4. Behavioral Intention	.55**	.56**	.54**	---

** $p < .01$

Hypotheses Tests

Before conducting the hypotheses tests, four iterations of principle component factor analysis using varimax rotation were conducted to establish the resulting 20-item FCTDS as outlined earlier in this chapter. A manipulation check of the message version was also conducted which showed that the means of the different message versions were near significant (p = .052). Based upon the reliability analysis of the Theory of Planned Behavior (Ajzen, 1991) subconstructs of attitude toward the behavior, subjective norm and perceived behavioral control, summated indices were developed. Attitude toward the behavior resulted in the highest mean score (M = 3.10, SD = .90, N = 410), followed by perceived behavioral control (M = 2.53, SD = .52, N =405), and subjective norm was showed the lowest mean score (M = 2.23, SD = .68, N = 407). The means for all the cells in the research design using behavioral intent as the dependent measure are reported in Table 4-12.

Table 4-12. Means Table for the Effect of Critical Thinking Disposition and Message Version on Behavioral Intent Using Likert Scale Where 1 = Strongly Disagree and 5 = Strongly Agree.

High CT Disposition	N	M	SD
Benefit	73	2.91	1.0
Control	66	2.66	1.1
Risk	64	2.40	1.0
Low CT Disposition	**N**	**M**	**SD**
Benefit	73	2.78	.97
Control	59	2.73	.91
Risk	73	2.65	.89

Table 4-13 displays the resulting means table for all the cells in the research design using attitude toward the behavior as the dependent measure.

To conduct Hypothesis 1 and Hypothesis 2 on behavioral intent, a 2 X 3 multivariate ANOVA was first run to evaluate the effects of critical thinking disposition (high and low) and message version (benefit, control and risk) on intent to perform the desired behavior (see Table 4-14). The ANOVA results showed no significant interaction between critical thinking disposition and message version, F (1, 404) = 1.31, p = .27 on intent toward the behavior but the results did indicate a main effect for message version, F (1, 404) = 3.47, p = .032.

Table 4-13. Means Table for the Effect of Critical Thinking Disposition and Message Version on Attitude toward the Behavior Using Likert Scale Where 1 = Strongly Disagree and 5 = Strongly Agree.

High CT Disposition	N	M	SD
Benefit	73	3.20	.99
Control	66	3.10	1.0
Risk	64	2.88	.86
Low CT Disposition	**N**	**M**	**SD**
Benefit	73	3.00	.85
Control	59	3.04	.98
Risk	73	2.73	.56

Table 4-14. ANOVA Results for Critical Thinking Disposition and Message Version on Behavioral Intent (N = 404).

Source	df	F	p
Critical thinking disposition	1	.391	.532
Message version	1	3.47	.032
CT * Message Version	2	1.32	.270

Post hoc analysis of the main effect for message version on intent to perform the behavior (p = .03) was conducted utilizing Bonferroni comparisons to control for Type I error (Agresti & Finlay, 1997). These results showed that the significant difference existed between respondents who received the benefit message (M = 2.85), and those who received the risk message (M = 2.53) p < .05, indicating that respondents who received the benefit message formed a stronger intent to engage in the desired behavior than those who received the risk message (see Table 4-15). No significance difference was found for respondents receiving the control message (M = 2.70) and either the risk or benefit message.

Table 4-15. Means Difference Table for the Critical Thinking Disposition and Message Version on Behavioral Intent.

	Mean Difference	Std. Error	Significance
Benefit – Risk	.31	.122	.031
Benefit – Control	.150	.131	.757
Risk – Control	-.165	.151	.825

Hypothesis 1 predicted that subjects with high critical thinking dispositions who receive the benefit (positive frame) message will be more likely to intend to engage in the target behavior than subjects with low critical thinking dispositions who receive the same message. To test Hypothesis 1, a univariate ANOVA analysis was conducted holding constant for benefit message version on critical thinking disposition. Results indicated no significant difference between high and low-level critical thinking disposition for respondents who received the benefit message, F (1,145) = .115, p = .73. Hypothesis 1 was not supported.

Hypothesis 2 predicted that subjects with low critical thinking dispositions who received the risk (negative frame) message would be more likely to intend to engage in the target behavior than subjects with high critical thinking dispositions who receive the same message. To test this hypothesis, a univariate ANOVA was conducted holding constant for the risk message on intent to perform the behavior. The results indicated that there was no significant difference between the high and low-level critical thinking disposition of the respondents who received the risk message on level of intent toward the target behavior, F (1, 136) =1.79, p = .18. Hypothesis 2 was not supported.

To conduct Hypothesis 3 and Hypothesis 4 on attitude toward the behavior, a 2 X 3 multivariate ANOVA was first run to evaluate the effects of critical thinking disposition (high and low) and message version (benefit, control and risk) on attitude toward desired behavior (see Table 4-16). The ANOVA results showed no significant interaction between critical thinking disposition and message version, F (1, 387) = .733, p = .48 on attitude toward the behavior but the results did indicate a main effect for message version, F (1, 383) = 4.96, p = .008.

Table 4-16. ANOVA Results for Critical Thinking Disposition and Message Version on Attitude Toward the Behavior (N = 384).

Source	df	F	p
Critical thinking disposition	1	2.59	.108
Message version	1	4.96	.008
CT * Message Version	2	.733	.48

Post hoc analysis of the main effect for message version on intent to perform the behavior was conducted utilizing Bonferroni comparisons. These results showed that the significant difference existed between respondents who received the benefit message (M = 3.15), and those who received the risk message (M = 2.80) p < .05, indicating that respondents who received the benefit message formed a stronger attitude toward the desired behavior than those who received the risk message (see Table 4-17). No significance difference was found for respondents receiving the control message (M = 3.20) and either the risk or benefit message.

Table 4-17. Means Difference Table for the Critical Thinking Disposition and Message Version on Attitude toward the behavior.

	Mean Difference	Std. Error	Significance
Benefit – Risk	.346*	.110	.002
Benefit – Control	9.028E-02	.118	.446
Risk – Control	-.255	.136	.061

Hypothesis 3 predicted that subjects with high critical thinking dispositions who received the benefit message would be more likely to form a stronger attitude toward the target behavior than subjects with low critical thinking dispositions who received the same message. To test Hypothesis 3, a univariate ANOVA was conducted holding constant for benefit message version on critical thinking disposition. The results showed a significant difference between high and low-level critical thinkers who received the benefit message, F (1,136) = 5.61, p = .019 indicating that respondents with high-level critical thinking disposition who received the benefit message formed a stronger attitude toward the behavior (M = 3.30) than respondents with low-level critical thinking dispositions who received the same message (M = 3.00). Hypothesis 3 was supported.

Hypothesis 4 predicted that subjects with low critical thinking dispositions who received the risk (negative frame) message would be more likely form a stronger attitude toward the target behavior than subjects with high critical thinking dispositions who received the same message. To test Hypothesis 4, a univariate ANOVA was conducted holding constant for the risk message on attitude toward the behavior. The results indicated that there was no difference between respondents' with high and low-level critical thinking dispositions who received the risk message on attitude toward the target behavior, F (1, 136) = .967, p = .328. Hypothesis 4 was not supported.

Hypothesis 5 predicted that for subjects with high critical thinking dispositions, attitude toward the behavior, followed by perceived behavioral control, would be the strongest predictor variables of behavioral intent while for subjects with low critical thinking dispositions, subjective norm, followed by perceived behavioral control, would be the strongest predictor variables.

As reported earlier, high critical thinking dispositions were defined as ranging between 79 and 100 and low critical thinking dispositions were defined as ranging between 40 and 78. The groups were defined using a means split. Message versions included benefit (positive), risk (negative) and control (information only).

Initial analysis for Hypothesis 5 included exploring the predictive value of critical thinking disposition, and the Theory of Planned Behavior subconstructs of attitude toward the behavior, subjective norm, and perceived behavioral control on intent. These variables were entered into a multiple linear regression equation using the enter method (see Table 4-18). Based on the hypothesis, critical thinking was coded for the high and low groups. The regression equation showed the TOPB subconstructs of attitude toward the behavior, subjective norm and perceived behavioral control were all significant predictors (p=.000) while critical thinking disposition was not significantly correlated to intent.

Table 4 -18. Critical Thinking Disposition (CT), Attitude toward the behavior (AT), Subjective Norm (SN), and Perceived Behavioral Control (PBC) as Predictor Variables on Behavioral Intent..

Variables	r	Beta	R^2
CT	.019	-.055	
AT .	.546**	.281	
SN .	.559**	.285	
PBC	.534**	.295	.47

** p <.001

To test Hypothesis 5, analysis of the predictor variables was conducted using the stepwise multiple linear regression method while controlling for critical thinking disposition. Message version was included in the model through dummy coding with –1 = risk, 0 = control, and 1= benefit. This method was used to explore which variables would significantly explain the largest portion of the variance associated with the respondents' behavioral intent as a function of critical thinking disposition level.

Table 4-19 shows the progression of steps to develop the model while controlling for high critical thinking disposition. Step one portrays regression of subjective norm on behavioral intent. A statistically significant amount of variance for behavioral intent was explained by this entry, R-square = .36, F = 109.71, p = .000. Additional variance was explained by perceived behavioral control, R-square Change = .09, F Change = 31.22, p = .000. Further moderate variance was explained by inclusion of attitude toward the behavior, R-square Change = .05, F Change = 19.92, p = .000. Collectively, the three subconstructs of the TOPB model explained 51% of the variance. Due to its weak status, message version was excluded by the model (George & Mallery, 2001).

Table 4 -19. Hierarchical Linear Regression of Message Version, Attitude toward the behavior (AT), Subjective Norm (SN), and Perceived Behavioral Control (PBC) as Predictor Variables on Behavioral Intent while Controlling for High Critical Thinking Disposition.

Variables [a]	R^2	R^2 Change	F Change	Sig. of Change
Step 1				
SN	.37	.37	109.71	.000
Step 2				
ATT	.46	.09	31.22	.000
Step 3				
PBC	.51	.05	19.92	.000

[a] Message version excluded by the model.

Table 4-20 shows the progression of steps to develop the model while controlling for low critical thinking disposition. Step one portrays regression of subjective norm toward behavioral intent. A statistically significant amount of variance for behavioral intent was explained by this entry, R-square = .25, F = 63.80, p = .000. Additional variance was explained by including perceived behavioral control, R-square Change = .11, F Change= 33.03, p = .000. Inclusion of attitude toward the behavior was also significant with R-square Change = .04, F Change = 13.41, p = .000. The TOPB subconstructs explained 40% of the variance within the model. Due to its weak status, the message version was excluded by the model.

Table 4 - 20. Hierarchical Linear Regression of Message Version, Attitude toward the behavior (AT), Subjective Norm (SN), and Perceived Behavioral Control (PBC) as Predictor Variables on Behavioral Intent while Controlling for Low Critical Thinking Disposition.

Variables[a]	R^2	R^2 Change	F Change	Sig. of Change
Step 1				
SN	.25	.25	63.80	.000
Step 2				
PBC	.36	.11	33.03	.000
Step 3				
AT	.40	.04	13.41	.000

[a] Message version excluded by the model.

Hypothesis 5 was partially supported. The Theory of Planned Behavior (TOPB) (Ajzen, 1991) subconstructs were all significant predictor variables for both of the models controlling for high and low critical thinking dispositions. Exposure to the various message versions were not significant when controlling for high and low critical thinking disposition level. For high critical thinking dispositions, subjective norm, followed by attitude toward the behavior, explained most of the variance associated with the model. Perceived behavioral control was also a significant predictor for subjects with high critical thinking. For low critical thinking dispositions, subjective norm provided the greatest contribution to the model, was a significant predictor variable followed by perceived behavioral control, and attitude.

Post Hoc Analysis

Two of the hypotheses were partially or fully supported. However, the premise that critical thinking disposition would influence the respondents' behavioral intent was not supported. Consequently, analysis was conducted using ANOVA to further explore the relationship between high and low-level critical dispositions, message version, and the subject's responses to the message validation question of "message believable" to see where differences existed. This additional analysis was conducted to see if respondents with very high critical thinking dispositions were influenced differently by the deception message.

While the ANOVA analysis used to conduct the hypotheses tests used a split means approach to categorizing high and low-level critical thinking dispositions, the post hoc analysis re-categorized the respondents by using EMI scores ranging between 40-85 (N = 295), to classify respondents as having low level critical thinking dispositions, and EMI scores ranging between 86-100 (N=90,) to classify respondents as having high level critical thinking dispositions (see Table 4-21 for means).

To conduct the analysis, a 2 X 3 multivariate ANOVA was run to evaluate the effect of critical thinking disposition (high and low) and message version (benefit, control and risk) on the subjects' responses toward the message validation statement of "message believable" (see Table 4-22). The ANOVA results indicated no interaction between critical thinking disposition and message version for message believability, F (2, 383) =

1.32, p = .270, but the results did indicate a main effect for message version which is consistent with the previous analyses, F (1,384) = 3.47, p = .032 (see Table 4-22).

Table 4-21. Means Table for Critical Thinking Disposition[1] and Message Version on Message Validation Statement, "Message Believable" Using Likert Scale (1=not believable and 5 = believable.

Benefit Message	N	M	SD
High CT	56	3.96	1.32
Low CT	151	3.86	1.09
Risk Message	N	M	SD
High CT	14	2.71	.61
Low CT	87	3.06	.97
Control Message	N	M	SD
High CT	20	2.85	1.63
Low CT	57	3.00	1.40

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[1] Low critical thinking disposition respondents reported EMI scores ranging between 40-89 (N = 373) and high critical thinking disposition respondents reported EMI scores ranging between 90-100 (N=35).

Table 4-22. ANOVA Results for Critical Thinking Disposition[1] and Message Version on Message Validation Statement of Message Believable (N = 385).

Message Believable	df	F	p
Critical thinking disposition	1	.391	.532
Message version	1	3.47	.032
CT * Message Version	2	1.32	.270

---

[1] Low critical thinking disposition respondents reported EMI scores of 40-89 (N = 373) and high critical thinking disposition respondents reported EMI scores of 90-100 (N=35).

Follow-up analysis of the main effect of message version on the message validation statement "message believable" was conducted utilizing Bonferroni comparisons. These results indicated that the significant differences existed between who received the benefit message (M = 3.88), and respondents who received the risk message (M = 3.01) p = .000, indicating that respondents who received the risk message did not find the message as believable as respondents who received the benefit message (see Table 4 -23). Significant differences also existed between respondents who received the benefit message and the control message (M =2.96).

While there was no main effect for critical thinking disposition, it is worth noting that utilizing the 20-85/86-100 EMI score split to categorize critical thinking disposition indicated that high level critical thinking disposition respondents who received the risk and control messages had a lower overall mean score than low level critical thinking disposition respondents who received the same message versions.

Table 4-23. Means Difference Table for the Critical Thinking Disposition[1] and Message Version on Message Validation Statement of Message Believable (N = 385).

	Mean Difference	Std. Error	Significance
Benefit – Risk	.66*	.14	.000
Benefit – Control	.93*	.16	.000
Risk – Control	4.89E-02	.18	1.00

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[1] Low critical thinking disposition respondents reported EMI scores of 40-89 (N = 373) and high critical thinking disposition respondents reported EMI scores of 90-100 (N=35).

The survey included an open-ended question asking the respondents what they would do to remove lovebugs from the car the owned, or had access to, during the next lovebug season. Of the 408 subjects, 117 responded that they would take their car to a commercial carwash to remove the lovebugs, 99 responded that they would remove the love bugs by washing their car themselves, and 139 responded that they might wash their car themselves or take it to a commercial carwash depending on whether they had the time and/or money to take the vehicle to a commercial carwash. The remaining 78 subjects did not answer this question.

Additional analysis was conducted using ANOVA to explore the relationships between the demographics variables of major, group affiliation, gender and their behavioral intent as well as the constructs of attitude toward the behavior, subjective norm and perceived behavioral control. There were no significant effects.

CHAPTER 5
DISCUSSION

Overview

This study examined the influence of critical thinking disposition and exposure to a positive or negatively framed risk message on attitude and intent to engage in a behavior designed to prevent a low-involvement environmental risk. To conduct this study, the potential relationship between critical thinking disposition and exposure to message frames were analyzed. The goal of this study was to determine whether messages about a low-involvement risk can be framed as to appeal to specific critical thinking dispositions in order to bring about intent to engage in a desired behavior.

Key Findings and Implications of the Study

In general this study provided potential support for critical thinking disposition as a factor in how individuals process messages about low-involvement environmental risk in terms of their subsequent attitude and behavioral intent. Generally speaking, most subjects had a favorable attitude and intent toward engaging in the target behavior, which was designed to be preventive in nature, in order to address a potentially damaging environmental situation involving invasive species.

Although no interaction between critical thinking disposition and message version was observed for behavioral intent, there was a significant main effect for the message version, indicating that subjects who received the benefit message version held a stronger level of behavioral intent than subjects who received the risk message version. This supports other research that has shown that one can be motivated by the potential benefits of adopting a new behavior (Rogers & Shoemaker, 1971).

Messages focusing on fear, or risks, have been found to be less effective than messages focusing on benefits in regards to the enhancement of self-efficacy (Meyerowitz & Chaiken, 1987). This was borne out by the analysis in terms of the respondents with high critical thinking dispositions when the respondents were categorized based on EMI scores of 20-85 (low) and 86-100 (high). Using this framework, the high critical thinking disposition respondents found the control and risk messages to be less believable. Alternatively, the high critical thinking disposition respondents were more receptive to the benefit message frames where the gains may have been compatible with the respondents existing beliefs and thus served to prompt the respondents to engage in a more systematic approach to evaluating the information.

However, it must be noted that the low level critical thinking respondents who received the risk message did find the message to be more believable which supports the work by Smith and Petty (1996) that unexpected message frames may serve to pique the interest of individuals who expect to receive information that focuses on the benefits and gains of specified behavior.

Ultimately, based on these results, low-involvement environmental risk situations where the desired behavior is preventive in nature, such as that used in this study, consideration should be given to developing information that focuses on the benefits gained by behaving in a proscribed manner to more or less reassure the message recipient that if certain steps are employed, a positive outcome will occur if the target audience is perceived as possessing high level critical thinking dispositions. The reverse approach might be considered if the target audience if perceived as having low level critical thinking dispositions.

Additionally, the results of this study showed that subjects with high critical thinking dispositions who received the benefit message formed a stronger attitude toward the behavior than subjects with low critical thinking dispositions who also received the benefit message. This finding suggests that subjects with high critical thinking dispositions may be utilizing systematic processing at an increased rate over subjects with low critical thinking dispositions. Trumbo (1999) states that systematic processors are defined by effortful scrutiny and comparison of information while heuristic processing is defined by the use of cues to more easily arrive at a judgment. Systematic processors may form stronger attitudes and have higher levels of perceived control for behavioral intent while heuristic processors may rely on peers (subjective norm) for cues to determine behavioral intent. Based on this finding, there is the potential to create information that targets systematic processors, by developing messages which delivers the information in a logical, fact-based manner as was used in this study. Alternatively, heuristic processors may effectively targeted by linking near-peers support of the desired behavior which prompts cue-based evaluation. This is often done by use of celebrity testimonials as well as by word of mouth.

Results of the regression analysis indicated that subjective norm made the largest contribution to the model when controlling for both high and low critical thinking dispositions. Interestingly, following subject norm, for subjects with high critical thinking dispositions, attitude toward the behavior contributed the most to the model while for subjects with low critical thinking dispositions, perceived behavioral contributed the most. Rogers (1995) indicates that humans undergo a process when making a decision about about adopting a new behavior. When new information is presented, one characteristic used to evaluate the information is communicating with others. This suggests that it may be worth addressing the value of peer concerns in developing messages about low involvement risks although the importance of the subjective norm may have been a factor of the age group of the respondents who primarily ranged between 18 and 22 years old.

Limitations

A potential limitation of this study was the use of college students as subjects. Although care was taken to develop the message and target behavior so as to be salient to the subjects, the results are therefore limited and cannot be generalized to other populations. The use of college students drawn from the population resulted in a homogeneous sample. The respondents were exposed to the message only once, in early February, which was three months away from the next lovebug season resulting in reduced salience for the topic. Another limitation has to do with the reliability of the FCTDS instrument used in this study. Initial analysis of the subconstructs indicated problems with the reliability of the maturity subconstruct which was ultimately dropped from the instrument. Ultimately, a reliable instrument was established through factor analysis utilizing two of the original constructs. Based on the above, further testing of this instrument is warranted.

Conclusions and Directions for Future Research

While only two of the hypotheses were supported in this study, inferences can still be made regarding message framing and critical thinking disposition in terms of low-involvement environmental risks. In the specific terms of this study, it is important to understand that knowledge about the environment and how its ecological systems work is still relatively new. Focused attention in this domain is even newer, less than 40 years old (Loftis, 1997). Add to this the lack of symbolic representation of specific environmental problems and that lay people perceive environmental risks to be manageable -- more so than experts do.

Research has shown that campaigns developed to change a behavior are often most successful when generated at a grassroots level within reference groups (Ungar, 1994). It is nearly impossible to legislate compliance in regards to individual behavior that impacts the environment. However, in the decision making process, individuals may be persuaded to adopt a behavior based upon the relative advantage of the new behavior which is determined by observing other near peers actively engaged in the behavior. Thus localized grassroot groups who are championing a specific behavior may provide the impetus to persuade others to adopt the desired behavior by demonstrating the compatible characteristics of the new behavior.

In terms of an environmental issue such as invasive species, there are many different types of groups, such as homeowners, producers, truckers, etc., that would need to be targeted to effect a change in attitude and ultimately behavior. The results of this study indicate that one's subject norm, or peer affiliation, may be a significant factor in how one evaluates the information in order to change an attitude or form an attitude that is compatible with existing attitudes.

Research indicates that due to the lack of imminent consequences, low-involvement risks are often processed heuristically versus systematically. Based upon the results of this study, it could be argued that it would be beneficial to target heuristic processing through messages by providing cues that target the subjective norm perception. Future research is recommended for exploring the role of message frames that include a component addressing the subjective norms of various stakeholder groups and the decision makers found within these environmental groups such as can be found within trade information sources. It would be beneficial to learn if overall decision makers tend to have high or low-level critical thinking dispositions.

The analysis indicated that respondents with high critical thinking disposition and benefit message frames did produce a stronger attitude toward intent to perform the behavior than respondents with low critical thinking disposition who received the same message, which supports similar studies where respondents with a high need for cognition and problem solving formed the stronger attitudes. The role of critical thinking may be a pivotal component of successfully implementing strategies developed to address low-involvement risks. One's disposition to be accessible to new information (innovativeness) and to use reasoning (engagement) to interpret information can be important in the environmental domain, especially for subjects who view it as a macrocategory. Information about critical thinking dispositions can help communicators develop information that specifically targets the processing systems associated with these dispositions. Additional research is needed to assess critical thinking disposition and its relationship to systematic and heuristic processing systems. Further work should also be conducted concerning critical thinking and stakeholder groups to explore if critical thinking disposition plays a role in group membership(s).

Recommendations

Low involvement risks, such as invasive species, have the potential to be a real problem for communicators within the agricultural and natural resource industries. With expanded trade agreements and increased tourism, this environmental risk is poised to become a major problem resulting in monetary losses as well as being a potential threat to our food supply. Once established, invasive species are almost impossible to eradicate and measures taken to keep them under control are costly and can cause further environmental damage.

Unlike high involvement risks such as deforestation and water pollution that have signal values for most lay people, invasive species are low in signal value, and the desired behavior that communicators need to convey is preventive in nature. Since involvement is low and the result of individual action (or inaction) is not directly observable, communicators may be hard pressed to target and create messages that are likely to successfully activate cognitive processes and result in formation of positive attitudes and behavior. Therefore, it is critically important that we look for other factors that may influence individuals' message processing, such as critical thinking disposition, in order to develop a better understanding of how these cognitive tendencies might operate in terms of evaluating messages designed to stimulate a preventive behavior.

At the present time, the invasive species issue presents as a low-involvement environmental risk. The time to engage in preventive behavior is before the risk moves from low-involvement to an outright crisis. Developing a better understanding will enable agricultural and natural resources communicators to develop effective strategies to evoke interest in these issues to the point where people move from information processors to information seekers. Knowledge about critical thinking disposition and its role as an antecedent to formation of attitudes and behavioral intent may provide insight as to ways to develop effective strategies such as messages that prompt systematic processing by the recipient. Efforts to link existing attitudes to the desired behavior may provide the subjective norm support that serves to persuade a target audience to adopt the desired behavior. By linking the desired behavior to an existing attitude, the target audience may be more easily persuaded even if heuristic processing is used. Additionally, systematic processing is more easily invoked if the linkage to the desired behavior fits into an existing framework. Decision makers for grassroot organizations may serve as the most useful linkage in forming attitudes that support the newly desired behavior; thus information about the critical thinking dispositions of these decision makers is useful in developing information about the desired behavior.

Furthermore, research-generated information about message frames that address specific subconstructs found within the Theory of Planned Behavior framework may also provide valuable insight for communicators dealing with these types of low-involvement risk issues where individual preventive behavior is the desired outcome. As the world becomes more globally intertwined, the risk from non-indigenous species to our fragile natural ecosystems becomes more of a potential threat, and the need to develop effective communication about low-involvement risk issues such as invasive species becomes even more important. As the proverb says, “An ounce of prevention is worth a pound of cure.”

APPENDIX A

MESSAGE STIMULUS

The three message versions used in this study and are found on the following pages in the following order:

- Benefit message
- Risk message
- Control message

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UF STUDY: NEW METHOD RECOMMENDED TO REMOVE LOVEBUGS

FEB. 21, 2003
Contact Information

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Lovebugs are highly visible in the months of May and September in Florida. During these months, known as lovebug season, the remains of lovebugs are frequently found plastered to the front grill and hood of automobiles. The body fluids of the lovebug are slightly acidic and if the spattered remains are not removed from your car within a few days, the acidity level increases and binds with the paint on automobiles. A simple and effective solution for removing lovebugs from your automobile has been to wash the car with hot water and soap.

Research has shown that the acidic buildup in the soil from lovebugs is generally not found in the soil at commercial carwashes. A sanitizer, used by most commercial carwashes in the cleaning process, neutralizes the acidic levels associated with lovebugs. This sanitizing agent has no known harmful effect on the environment and by neutralizing the acid from the lovebugs, it can help protect future populations of ladybugs.

A simple solution for getting rid of lovebugs, and helping the environment, is to take your automobile to a commercial carwash. Most carwashes are conveniently located and the cost of a basic carwash is inexpensive. By choosing to use a commercial carwash instead of washing your automobile at home, you will help reduce the levels of acidic fluids found in the soil and help protect future populations of ladybugs. Many local and national environmental groups are encouraging Florida's citizens to voluntarily take their vehicles to a carwash during the months of May and September to remove the lovebugs.

-30-

Writer: Paul Rusch, (352) 392-0756, prusch@ufl.edu
Source: Chris Lee, (352) 392-9586, Ext. 1356; clee@hhp.ufl.edu

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By choosing to wash your automobile at home, especially in densely populated areas, you will contribute to the increased levels of acidic fluids found in the soil and potentially contribute to reduced populations of ladybugs. In recent months several county commissioners in Florida have considered whether or not to ban car owners from washing their vehicles during the months of May and September in order to address this problem. This ban is supported by several local and national environmental groups.

-30-

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APPENDIX B

QUESTIONNAIRE USED IN STUDY

All three message versions, benefit, risk and control, are included in this appendix. The subjects were randomly assigned to receive only one version of the message.

Please read the information below to receive 2 extra credit points for Dr. Zettler's class.

1. This is a take-home extra credit opportunity for Dr. Zettler's class.
2. You will need a Number 2 pencil to bubble in the scantron.
3. Please bubble in your name in the space provided on the scantron.
4. DO NOT change the number that has already been bubbled in the space on the scantron for the social security number or the special codes section.
5. Return the entire questionnaire and scantron on Monday, March 3, 2003 or Wednesday, March 5, 2003 in order to receive your extra credit points.
6. In the space provided below, please print your name, sign your name and write your UF ID number.

Print your name here:

Sign your name here:

Print your UF ID number here:

Please turn the page to read the informed consent statement. You are required to sign this statement. Thank you for your participation.

Florida Critical Thinking Disposition Instrument (FCTDI)

Please bubble in the number on the scantron that best reflects your response to the following statements.

1. I always believe there is more to be learned.

   strongly disagree 1 2 3 4 5 strongly agree

2. When someone disagrees with me I usually tune him or her out.

   strongly disagree 1 2 3 4 5 strongly agree

3. I look for opportunities to use my problem solving skills.

   strongly disagree 1 2 3 4 5 strongly agree

4. I am interested in many issues.

   strongly disagree 1 2 3 4 5 strongly agree

5. It is important for me to have a deep understanding of more than one issue.

   strongly disagree 1 2 3 4 5 strongly agree

6. I am able to relate to a wide variety of issues.

   strongly disagree 1 2 3 4 5 strongly agree

7. I ask lots of questions in a learning environment.

   strongly disagree 1 2 3 4 5 strongly agree

8. People trust my opinion.

   strongly disagree 1 2 3 4 5 strongly agree

9. I am a good problem solver.

   strongly disagree 1 2 3 4 5 strongly agree

10. I am confident that I can reach a reasonable conclusion.

    strongly disagree 1 2 3 4 5 strongly agree

11. It is important to be well informed.

    strongly disagree 1 2 3 4 5 strongly agree

12. I am not likely to change my values even when I am given new information that might conflict with them.

strongly disagree 1 2 3 4 5 strongly agree

13. I like to think things through.

strongly disagree 1 2 3 4 5 strongly agree

14. I enjoy solving problems.

strongly disagree 1 2 3 4 5 strongly agree

15. I know I have biases and if other people can't accept that fact, it is their problem.

strongly disagree 1 2 3 4 5 strongly agree

16. I am able to apply my knowledge to a wide variety of issues.

strongly disagree 1 2 3 4 5 strongly agree

17. I enjoy learning even when I am not in school.

strongly disagree 1 2 3 4 5 strongly agree

18. I can cut through all the fluff and get to the core of a problem.

strongly disagree 1 2 3 4 5 strongly agree

19. I can quickly judge people and decide whether or not I will get along with them.

strongly disagree 1 2 3 4 5 strongly agree

20. I am able to explain things clearly.

strongly disagree 1 2 3 4 5 strongly agree

21. I ask good questions when trying to clarify a situation.

strongly disagree 1 2 3 4 5 strongly agree

22. You can't predict someone's actions and behaviors based on their race.

strongly disagree 1 2 3 4 5 strongly agree

23. I present issues in a clear and precise manner.

strongly disagree 1 2 3 4 5 strongly agree

24. The people from my hometown are better people than those from other communities.

strongly disagree 1 2 3 4 5 strongly agree

25. My views are not always right.

strongly disagree 1 2 3 4 5 strongly agree

26. There are always different ways to answer a question.

strongly disagree 1 2 3 4 5 strongly agree

27. Simple solutions exist for most problems.

strongly disagree 1 2 3 4 5 strongly agree

28. I keep working on things until I get them right.

strongly disagree 1 2 3 4 5 strongly agree

29. I am good at finding the information that I need.

strongly disagree 1 2 3 4 5 strongly agree

30. I'll go out of my way to find the right answer to a problem.

strongly disagree 1 2 3 4 5 strongly agree

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Lovebugs are a non-native species that live in Florida. During the months of May and September lovebugs are commonly found along Florida's highways. Please take a few minutes to write down your thoughts about lovebugs in the spaces provided below.

Thought 1:

Thought 2:

Thought 3:

Thought 4:

Thought 5:

Please bubble in the scantron with the response that best describes your behavior.

31. I turn off the tap water while I brush my teeth.

never 1 2 3 4 5 always

32. I recycle.

never 1 2 3 4 5 always

33. I have the oil changed in my car at least every 3000 miles.

never 1 2 3 4 5 always

34. I am a litterbug.

never 1 2 3 4 5 always

35. I use cold water to wash my clothes.

never 1 2 3 4 5 always

Please bubble in the scantron with the number that best describes your response to how much you agree with the following statements.

36. Based on what I just read, taking my car to a commercial car wash to remove lovebugs during the next lovebug season will make a **positive** contribution to the environment.

extremely unlikely 1 2 3 4 5 extremely likely

37. Making a **positive** contribution to the environment is

extremely bad 1 2 3 4 5 extremely good

38. Based on what I just read, taking my car to a commercial carwash to remove lovebugs during the next lovebug season will help **decrease** the amount of lovebug acid found in the soil which can negatively impact the ladybug population.

false 1 2 3 4 5 true

39. **Decreasing** the amount of lovebug acid buildup in the soil as a result of washing my own car is

unimportant 1 2 3 4 5 important

40. Based on what I just read, taking my car to a commercial carwash during the next lovebug season is:

unimportant 1 2 3 4 5 important

41. I do **not** need to take my car to the carwash during the next lovebug season.

false 1 2 3 4 5 true

42. Based on what I just read, I can help **protect** the life cycle of ladybug populations by taking my car to a commercial carwash during the next lovebug season.

very unlikely 1 2 3 4 5 very likely

43. **Protecting** the life cycle of the ladybug populations is

very bad 1 2 3 4 5 very good

44. Based on what I just read, taking my car to a commercial carwash during the next lovebug season is something **positive** that I can do to help protect future generations of ladybugs.

false 1 2 3 4 5 true

45. Protecting future generations of ladybugs is

harmful 1 2 3 4 5 beneficial

Please bubble in the scantron with the number that best describes your responses to the following statement.

My attitude toward taking my car to the carwash during the next lovebug season is:

46.	negative	1	2	3	4	5	positive
47.	bad	1	2	3	4	5	good
48.	unfavorable	1	2	3	4	5	favorable
49.	supportive	1	2	3	4	5	unsupportive
50.	unappealing	1	2	3	4	5	appealing
51.	unpleasant	1	2	3	4	5	pleasant
52.	unenjoyable	1	2	3	4	5	enjoyable
53.	valuable	1	2	3	4	5	worthless
54.	beneficial	1	2	3	4	5	harmful

Please bubble in the scantron with the number that best describes your response to the following statements.

55. Based upon the information I just read, **my family** expects me to take my car to a commercial carwash to remove the lovebugs during lovebug season.

I definitely should not 1 2 3 4 5 I definitely should

56. Generally speaking, how much do you do what **your family** expects you to do?

never 1 2 3 4 5 always

57. Based upon the information I just read, **my friends** expect me to take my car to a commercial carwash to remove the lovebugs during lovebug season.

extremely unlikely 1 2 3 4 5 extremely likely

58. I typically do what **my friends** expect me to do.

never 1 2 3 4 5 always

59. People whose opinion I value expect me to make environmentally responsible decisions such as taking my car to a commercial carwash during the next lovebug season.

never 1 2 3 4 5 always

60. I typically do what people whose opinion I value expect me to do.

very unlikely 1 2 3 4 5 very likely

61. In general, **society** thinks that I should take my car to a commercial carwash to remove the lovebugs during the next lovebug season.

I should not 1 2 3 4 5 I should

62. To me, conforming to societal standards is

very unimportant 1 2 3 4 5 very important

63. Taking my car to a commercial carwash during lovebug season would indicate that I hold **pro-environmental** views.

strongly disagree 1 2 3 4 5 strongly agree

64. To me, holding **pro-environmental** views is

negative 1 2 3 4 5 positive

Based upon the information I just read, taking my car to a commercial carwash to remove lovebugs during the next lovebug season is:

65.	expected	1	2	3	4	5	unexpected
66.	undesirable	1	2	3	4	5	desirable
67.	not required	1	2	3	4	5	required
68.	not mandatory	1	2	3	4	5	mandatory
69.	acceptable	1	2	3	4	5	unacceptable

70. It is **expected** that I will take my car to a commercial carwash during the next lovebug season.

extremely unlikely 1 2 3 4 5 extremely likely

71. The people in my life whose opinion I value take their car to a commercial carwash to remove the lovebugs during the next lovebug season based on what I just read.

definitely would not 1 2 3 4 5 definitely would

72. I **expect** that my **studies** at the University of Florida will place high demands on my **time** during the next lovebug season.

strongly disagree 1 2 3 4 5 strongly agree

73. The **demands** from my **studies** in terms of my **time** during the next lovebug season will make it harder for me to take my car to a commercial carwash.

much harder 1 2 3 4 5 much easier

74. I **expect** that my **studies** at the University of Florida will place high demands on my **finances** during the next lovebug season.

strongly disagree 1 2 3 4 5 strongly agree

75. The **demands** from my **studies** in terms of my **finances** during the next lovebug season will

make it **harder** for me to take my car to a commercial carwash.

much harder 1 2 3 4 5 much easier

76. I **expect** that **job** related pressures will place high demands on my **time** during the next lovebug season.

strongly disagree 1 2 3 4 5 strongly agree

77. The **demands** from my **job** in terms of my **time** during the next lovebug season will make it **harder** for me to take my car to a commercial carwash.

much harder 1 2 3 4 5 much easier

78. I **expect** that my **family** will place high demands on my **time** during the next lovebug season.

strongly disagree 1 2 3 4 5 strongly agree

79. The **demands** from my **family** in terms of my **time** during the next lovebug season will make it **harder** for me to take my car to a commercial carwash.

much harder 1 2 3 4 5 much easier

80. I **expect** that my **friends** will place high demands on my **time** during the next lovebug season.

strongly disagree 1 2 3 4 5 strongly agree

81. The **demands** from my **friends** in terms of my **time** during the next lovebug season will make it **harder** for me to take my car to a commercial carwash.

much harder 1 2 3 4 5 much easier

Based upon the information I just read, taking my car to a commercial carwash to remove lovebugs during lovebug season is:

82.	easy to do	1	2	3	4	5	hard to do
83.	convenient	1	2	3	4	5	inconvenient
84.	unusual behavior	1	2	3	4	5	usual behavior
85.	expensive	1	2	3	4	5	cheap
86.	unlikely	1	2	3	4	5	likely

87. Based upon the information I just read, taking my car to a commercial carwash to remove lovebugs during the lovebug season would be

impossible 1 2 3 4 5 possible

88. Based upon the information I just read, I could take my car to a commercial carwash to remove the lovebugs during lovebug season if I wanted to.

definitely false 1 2 3 4 5 definitely true

89. I believe that I have complete control over taking my car to a commercial carwash to remove the lovebugs during lovebug season?

no control 1 2 3 4 5 complete control

90. It is mostly up to me whether or not I take my car to a commercial carwash to remove the
lovebugs during lovebug season.

strongly disagree 1 2 3 4 5 strongly agree

91. I will take my car to the commercial carwash during the next lovebug season even if it is **not convenient** to reduce the amount of lovebug acid in the soil.

strongly disagree 1 2 3 4 5 strongly agree

92. I will take my car to the commercial carwash during the next lovebug season even if it costs **more money** than washing my own car to reduce the amount of lovebug acid in the soil.

strongly disagree 1 2 3 4 5 strongly agree

93. I will take my car to the commercial carwash during the next lovebug season to stop acidic build-up in the soil which can occur if I wash the lovebugs off of my car.

false 1 2 3 4 5 true

94. I will take my car to the commercial carwash during the next lovebug season to help stop the decline of the ladybug populations.

false 1 2 3 4 5 true

95. I will take my car to the commercial carwash during the next lovebug season.

false 1 2 3 4 5 true

96. Based upon the information I just read, I **intend** to take my car to a commercial carwash to remove the lovebugs during lovebug season.

extremely unlikely 1 2 3 4 5 extremely likely

97. Based upon the information I just read, I will **try** to take my car to a commercial carwash to remove the lovebugs during lovebug season.

definitely false 1 2 3 4 5 definitely true

98. Based upon the information I just read, I **plan** to take my car to a commercial carwash to remove the lovebugs during lovebug season.

strongly disagree 1 2 3 4 5 strongly agree

99. I intend to help stop the decline of the ladybug population by taking my car to a commercial carwash during the next lovebug season.

definitely false 1 2 3 4 5 definitely true

100. I plan to reduce the amount of acidic buildup found in the soil from washing lovebugs off of vehicles at home by taking my car to a commercial carwash during the next lovebug season.

definitely false 1 2 3 4 5 definitely true

101. Do you own a car?
   1. Yes
   2. No

102. If you do not own a car, do you have access to a car (parents, roommate, friend, etc.)?
   1. I own my car.
   2. Yes
   3. No

103. The car that your own or have access to is (estimate if you are not sure):
   1. 0-2 years old
   2. 3-4 years old
   3. 5-6 years old
   4. 7 years or older
   5. I do not own or have access to a car

104. If you own your car, who paid the most money for the car?
   1. Self
   2. Parents/Guardian
   3. Other, (please specify)___________.
   4. I do not own a car.

105. Please check the response that **best reflects** how you usually feel about the car you own or have access to.
   1. I love having a car.
   2. I like having a car because it is convenient to use.
   3. Having a car is nice but it is a drain on my finances.
   4. My car is almost more trouble than it is worth.
   5. I do not own a car.

106. How many clubs or organizations do you belong to?
   1. 0
   2. 1
   3. 2
   4. 3
   5. 4 or more

107. The club or organization that I belong to and which is the **most important** to me can be best classified as:
    1. Religious
    2. Pre-professional or professional
    3. Environmentally focused
    4. Economically focused
    5. I do not belong to any clubs or organizations

108. If you do not belong to any clubs or organizations, what is the **primary reason** that you do not belong?
    1. Not interested in any clubs or organizations.
    2. I don't have time for clubs and organizations.
    3. I don't have the money for clubs and organizations.
    4. Other reason (please specify)._______
    5. I do belong to a club or organization

109. What is your gender?
    1. Female
    2. Male

110. What is your age?
    1. 18-19
    2. 20-21
    3. 22-23
    4. 24-25
    5. 26 or older

111. My major can best be classified as:
    1. Social sciences (humanities, English, history, journalism, education, etc.)
    2. Business (economics, marketing, accounting, etc)
    3. Science (pre-med, chemistry, physics, food science, engineering, agriculture, biology, etc.)
    4. The arts (music, dance, art, theatre)
    5. Other (please specify in the blank). ___________

112. Have you used scholarship money to help pay for your car?
    1. Yes
    2. No
    3. I do not own a car

113. Have you used student loan money to help pay for your car?
    1. Yes
    2. No
    3. I do not own a car

114. What is your anticipated graduation date?
    4. May 2003
    5. August 2003 or later

115. What is your ethnicity?
    6. Black
    7. Hispanic
    8. Asian
    9. White
    10. Other

The message presented in this survey about the lovebug population is presented as being:

116.	negative	1	2	3	4	5	6	7	positive
117.	weak	1	2	3	4	5	6	7	strong
118.	not persuasive	1	2	3	4	5	6	7	persuasive
119.	not informative	1	2	3	4	5	6	7	informative
120.	not believable	1	2	3	4	5	6	7	believable
121.	not factual	1	2	3	4	5	6	7	factual
122.	not realistic	1	2	3	4	5	6	7	realistic

123. I have taken the following courses:
    2. AEE –3030 – Effective Oral Communications
    3. AEE – 3033 – Technical Writing for Agriculture and the Environment
    4. Both AEE 3030 and AEE 3033
    5. Neither AEE 3030 or AEE 3033

124. Let's assume that you own or have access to a car on a regular basis. During the next lovebug season, what will you do to **remove** the lovebugs from your car? Please answer in the space provided below.

Please proceed to the next page ⇨

Survey Debriefing

Please read the following paragraph.

Thank you for participating in this study. The purpose of this study is to determine your attitudes toward an invasive species issue and messages that are developed to address this issue. Lovebugs were selected as a topic because most people are familiar with them. However, THERE IS NOT NOW NOR HAS THERE EVER BEEN ANY INDICATION THAT REMOVING LOVEBUGS BY WASHING YOUR OWN CAR IMPACTS THE ENVIRONMENT. THERE IS NO BASIS FOR THE CLAIM FOUND IN THE INFORMATION YOU JUST READ THAT STATES THAT LOVEBUGS ADD ACIDIC FLUID TO THE SOIL OR THAT LOVEBUGS IN ANY WAY HAVE A NEGATIVE IMPACT ON LADYBUG POPULATIONS. This type of study, a deception study, is used to increase our knowledge about how and why subjects form attitudes toward environmental issues and if messages can influence how the subject will behave toward the issue. Again, thank you for your participation.

By signing on the line below, you are indicating that your have read and understand the disclaimer above.

Name: **Date:**

APPROVED BY
University of Florida
Institutional Review Board (IRB 02)
Protocol #__________________
For Use Through 2-13-04

Please proceed to the next page ⇨

APPENDIX C

PILOT TEST

Please indicate how much you agree with the following statements by filling in the scantron.

1. Taking my car to a commercial carwash to remove lovebugs during lovebug season will make a positive contribution to the environment.

   extremely unlikely 1 2 3 4 5 extremely likely

2. Making a positive contribution to the environment is

   extremely bad 1 2 3 4 5 extremely good

3. Based upon the information I just read, I intend to take my car to a commercial carwash to remove the lovebugs during the next lovebug season.

   extremely likely 1 2 3 4 5 extremely unlikely

4. Based upon the information I just read, I will try to take my car to a commercial carwash to remove the lovebugs during the next lovebug season.

   definitely true 1 2 3 4 5 definitely false

Based upon the information I just read, taking my car to a commercial carwash to remove lovebugs during lovebug season is:

5.	important	1	2	3	4	5	unimportant
6.	positive	1	2	3	4	5	negative
7.	pleasant	1	2	3	4	5	unpleasant
8.	good	1	2	3	4	5	bad
9.	worthless	1	2	3	4	5	valuable
10.	good	1	2	3	4	5	bad
11.	favorable	1	2	3	4	5	unfavorable
12.	pro	1	2	3	4	5	con
13.	appealing	1	2	3	4	5	unappealing
14.	unexpected	1	2	3	4	5	expected
15.	likable	1	2	3	4	5	unlikable

16. My family thinks that

    I should 1 2 3 4 5 I should not

    take my car to a commercial carwash to remove the lovebugs during the next lovebug season.

17. Generally speaking, how much do you do what your family thinks you should do?

not at all 1 2 3 4 5 very much

18. Based upon the information I just read, I plan to take my car to a commercial carwash to remove the lovebugs during the next lovebug season.

strongly agree 1 2 3 4 5 strongly disagree

19. Based upon the information I just read, most people who are important to me would think that

I should 1 2 3 4 5 I should not

take my car to a commercial carwash to remove the lovebugs during the next lovebug season.

20. Based upon the information I just read, it is expected of me that I will take my car to a commercial carwash to remove the lovebugs during the next lovebug season.

extremely likely 1 2 3 4 5 extremely unlikely

21. Based upon the information I just read, the people in my life whose opinions I value would
approve 1 2 3 4 5 disapprove

of me taking my car to a commercial carwash to remove the lovebugs during the next lovebug season.

Based upon the information I just read, taking my car to a commercial carwash to remove lovebugs during lovebug season is:

22.	acceptable	1	2	3	4	5	unacceptable
23.	expected	1	2	3	4	5	unexpected
24.	desirable	1	2	3	4	5	undesirable
25.	required	1	2	3	4	5	not required
26.	demanded	1	2	3	4	5	not demanded

27. Most people who are important to me would take their car to a commercial carwash to remove the lovebugs during the next lovebug season based upon the information I just read.

completely true 1 2 3 4 5 completely untrue

28. The people in my life whose opinions I value

would 1 2 3 4 5 would not

take their car to a commercial carwash to remove the lovebugs during the next lovebug season based upon the information I just read.

29. I expect that my studies at the University of Florida will place high demands on my time during the next lovebug season:

strongly disagree 1 2 3 4 5 strongly agree

30. I expect that my studies at the University of Florida will place high demands on my finances during the next lovebug season:

strongly disagree 1 2 3 4 5 strongly agree

31. My studies placing high demands on my time during the next lovebug season will make it

much easier 1 2 3 4 5 much more difficult

for me to take me to take my car to the commercial carwash.

32. My studies placing high demands on my finances during the next lovebug season will make it

much easier 1 2 3 4 5 much more difficult

for me to take me to take my car to the commercial carwash.

33. Based upon the information I just read, taking my car to a commercial carwash to remove lovebugs during the next lovebug season would be

impossible 1 2 3 4 5 possible

34. Based upon the information I just read, I could take my car to a commercial carwash to remove the lovebugs during the next lovebug season if I wanted to.

definitely true 1 2 3 4 5 definitely false

35. How much control do you believe you have over taking your car to a commercial carwash to remove the lovebugs during the next lovebug season?

no control 1 2 3 4 5 complete control

36. It is mostly up to me whether or not I take my car to a commercial carwash to remove the lovebugs during the next lovebug season

strongly agree 1 2 3 4 5 strongly disagree

37. Taking my car to a commercial carwash to remove lovebugs during the next lovebug season will make a positive contribution to the environment.

extremely unlikely 1 2 3 4 5 extremely likely

Based upon the information I just read, taking my car to a commercial carwash to remove lovebugs during lovebug season is:

38.	easy to do	1	2	3	4	5	hard to do
39.	convenient	1	2	3	4	5	inconvenient
40.	expensive	1	2	3	4	5	inexpensive
41.	usual behavior	1	2	3	4	5	unusual behavior
42.	not costly	1	2	3	4	5	costly
43.	likely	1	2	3	4	5	unlikely
44.	controllable	1	2	3	4	5	uncontrollable
45.	intentional	1	2	3	4	5	unintentional

46. I will take my car to the carwash during the next lovebug season even if it is not convenient.

strongly agree 1 2 3 4 5 strongly disagree

47. I will take my car to the carwash during the next lovebug season even though it cost more money than washing my own car.

strongly agree 1 2 3 4 5 strongly disagree

48. Do you presently own or have access to a car?

1. Yes
2. No

49. What is your gender?
    1. Female
    2. Male
50. What is your age?
    1. 18-20
    2. 21-23
    3. 24-26
    4. 27 or older

51. What is your major?
    1. Agriculture or natural resources
    2. Business
    3. Liberal Arts
    4. Other (please specify) __________

The message I read at the beginning of this questionnaire is:

52.	positive	1	2	3	4	5	negative
53.	strong	1	2	3	4	5	weak
54.	persuasive	1	2	3	4	5	not persuasive
55.	informative	1	2	3	4	5	not informative

Please read the statement on the following page. Thank you for your participation!

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BIOGRAPHICAL SKETCH

Susan Grantham is a native Floridian. She has a B.A. in English from the University of Florida and an M.S. in agricultural communications from the University of Florida.

Susan has an extensive career experience working in the non-profit sector. She has worked in public relations with organizations dealing with the natural environment. She established and runs her own publishing company, Proofers. In addition to her professional work, Susan served as an instructor while completing her doctoral coursework.

Beginning in September 2003, Susan will assume a new position as an assistant professor at the University of Hartford in the School of Communications. Susan is married, and she and her husband Jim, have two children, Annie and Jimmy, and three dogs.

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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Tracy Irani, Chair
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